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INTRODUCTION.

This REVIEW is based on reports for December, 1889, from 1,928 regular and voluntary observers in the United States and Canada. These reports are classified as follows: 171 reports from Signal Service stations; 118 monthly reports from United States Army post surgeons; 1,266 monthly reports from state weather service and voluntary observers; 25 reports from Canadian stations; 348 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, North and South Dakota, Illinois, Indiana, Iowa, the Iowa Weather Crop Bulletin Service, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Meteorological Report of the Missouri State Board of Agriculture, Nebraska, Nevada, New England, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Texas, and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used. Snow blockades or floods prevented the forwarding of reports of the Central Pacific Railway Company and the rainfall observations of the United States Geological Survey in the southern plateau region in time to be used in this issue of the REVIEW.

CHARACTERISTICS OF THE WEATHER FOR DECEMBER, 1889.

East of the Rocky Mountains and south of the Great Lakes the current month was the warmest and driest December in the history of the Signal Service, while in parts of southern California the reverse of these conditions obtained and the greatest rainfall and the lowest mean temperature ever noted for December were reported.

The mean temperature for the month was above the average for December, except in the Pacific coast states and adjoining parts of the plateau region. The most marked departures above the average temperature occurred within an area embracing the lower Ohio and middle Mississippi valleys, where they generally exceeded 15°, and where, at Cairo, Ill., and Memphis, Tenn., they amounted to 17°.2. Along the Pacific coast the departures below the average temperature were less than 5°. At fifty-eight out of a total of eighty-nine regular stations of the Signal Service east of the Rocky Mountains having a record of ten years or more, and at the older established stations in New Mexico, Arizona, and Utah, the mean temperature was the highest December mean temperature ever reported, and at forty-one of these stations the absolute maximum temperature was higher than noted for the corresponding month of preceding years. At San Diego, Cal., nineteen years record, the mean temperature was the lowest ever noted for December. Over the country east of the Rocky Mountains the highest mean temperature previously reported for December generally occurred in 1877, except in New York and New England in 1881, in the south Atlantic and east Gulf states in 1879, and in the west Gulf states in 1875 or 1879, and the lowest December mean temperature generally occurred in the Mississippi Valley and eastward in 1876. The highest absolute temperature reported for December, 1889, was 100°, at Simpsonville, S. C., and the absolute minimum temperature was —24°, at Fraser, Colo. The lowest temperature ever reported for December was —59°, at Fort Benton, Mont., in 1880. No damaging frosts were reported for December, 1889, in the south Atlantic and Gulf states, which fact may be attributed to the unusually high temperature in that region. On the Pacific coast light frost occurred as far south as San Diego, Cal., on several dates.

The precipitation for the current month was the least ever reported for December at stations in Arkansas, Texas, Kansas, Iowa, Tennessee, Virginia, North Carolina, South Carolina, Georgia, and Florida, while at Los Angeles, Cal., the monthly rainfall, 15.80 inches, was the heaviest ever reported for one month at that station. The heaviest precipitation reported for December, 1889, was 29.36 inches, at Upper Mattole, Humboldt Co., Cal., and the precipitation exceeded twenty inches in the eastern Sacramento valley, between the thirty-eighth and fortieth parallels, and in areas along the California coast, north of the thirty-sixth parallel. In areas in east-central Arkansas, western Florida, eastern Georgia, northern Indian Territory, central, south-central, and western Kansas, extreme northwestern Missouri, southeastern Nebraska, extreme southern South Carolina, central Virginia, and east-central Wyoming no precipitation was reported. The greatest excesses in precipitation for December, 1889, occurred on the south Atlantic coast, where more than four times the usual amount of rain for the month fell, and on the middle Pacific coast and over the middle plateau region, where the precipitation was more than double the usual amount for December. The precipitation was also above the average for December over the eastern part of the Dakotas, in the Lake region, and in northern New England, the lower Saint Lawrence valley, and northern New Brunswick. In all districts east of the Rocky Mountains and south of the Lake region, except in the Missouri and upper Mississippi valleys, the precipitation was less than fifty per cent., and on the southeastern slope of the Rocky Mountains less than one per cent. of the usual amount of precipitation for December.

The greatest depth of snowfall reported was eighty-one and one-half inches, at Tuscarora, Nev. In northeastern California and northwestern Wyoming it exceeded sixty inches; in extreme northern Idaho, forty inches; in southwestern Colorado, extreme northern Michigan, and east-central Washington, thirty inches; in northwestern Minnesota, extreme western

Montana, southwestern Utah, and northeastern Wisconsin, twenty inches; and in western Maine, northeastern Massachusetts, southern and central New Hampshire and Vermont, west-central New Jersey, central and east-central New York, eastern Oregon, northeastern South Dakota, north-central Iowa, and east-central Arizona, ten inches. In the Sierra Nevada Mountains the railroads were blockaded for several days by snow, which drifted to a depth of eighteen to twenty-six feet, and in some of the canyons of Ormsby, Washoe, Lander, and Humboldt counties, Nevada, snow was reported packed in depths from twenty to over one hundred feet.

Heavy and continuous rains caused destructive floods in California, Arizona, and southern Nevada. Rivers overflowed their banks, levees broke, and great damage was done to public, railroad, and private property. At Sacramento, on the 12th, the Sacramento River was higher than ever before reported at that place.

The severest storms of the month attended the passage of a low pressure storm from northern Minnesota south of east to the middle Saint Lawrence valley and New England during the 25th and 26th. On the night of the 25th heavy gales, with rain and snow, prevailed over the Lake region; on the 26th heavy gales continued over the Lake region and on the Atlantic coast north of Hatteras, N. C.; and on the 27th high winds prevailed on the New England coast. Over the middle and western Atlantic Ocean there was an unusual prevalence of severe storms, while over and near the British Isles generally settled weather prevailed.

An unusual and remarkable feature for December was the numerous icebergs reported near the Banks of Newfoundland, where at this season Arctic ice is rarely encountered. Navigation generally closed for the season on Lake Michigan and Lake Superior, and navigation on the Missouri and upper Mississippi rivers was interrupted by ice. Owing to an ice gorge above Davenport, Iowa, the stage of the water in the Mississippi River at that place was the lowest ever noted. Damaging drought was reported in Georgia, North Carolina, eastern Florida, eastern Mississippi, southern Louisiana, and central Iowa. Well-defined auroral displays were reported at Fort Buford, N. Dak., on the 13th; at Hartford, Conn., on the 15th; at Fort Buford, N. Dak., and Leaf River, Ill., on the 26th; and at Fort Maginnis, Mont., on the 27th.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for December, 1889, 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 difference between the mean pressure for December obtained from observations taken twice daily at the hours named and that determined from hourly observations, varied at the stations named below, as follows: At Boston, Mass., New York City, Philadelphia, Pa., Washington City, Savannah, Ga., Chicago, Ill., Saint Louis, Mo., and Denver, Colo., the mean of the 8 a. m. and 8 p. m. observations was higher by .014, .019, .010, .009 .013, .001, .004, and .002, respectively, than the true mean pressure.

For December, 1889, the mean pressure was highest over the south Atlantic and east Gulf states and northern Florida, where it rose above 30.25, the highest mean reading, 30.28, being noted at Augusta, Ga., and Jacksonville, Fla., respectively. From this region northward and northwestward there was a gradual decrease in mean pressure to the northern border of the country, where the mean values generally fell below 30.00 east of the one hundred and fifteenth meridian, and where, on the extreme north Pacific coast, they were below 29.85. From the lower valley of the Columbia River there was an increase in mean pressure southward to extreme southern California, where the mean readings were above 30.05. A mean reading of 29.93 at Keeler, Cal., indicated a small area of comparatively low mean pressure in southwestern Nevada and the adjoining part of California.

A comparison of the pressure chart for December, 1889, with that of the preceding month shows that there was an increase in pressure east of a line traced from Michigan southwestward to eastern Texas, and that west of this line there was a general decrease in pressure. The most marked increase in mean pressure occurred in the south Atlantic and east Gulf states, where the mean readings were more than .10 higher than for the preceding month, and the greatest decrease in mean pressure occurred over the eastern part of the middle plateau region, where the mean values were more than .30 lower than for November, 1889. For November, 1889, the area of highest mean pressure occupied an area extending from Colorado northward to southern Idaho, within which the values rose above 30.25, and the mean pressure was lowest in the lower Saint Lawrence valley and in north-central Ontario, where the readings were below 30.00. For the current month the readings within the area of highest mean pressure over the southeastern part of the country corresponded closely with the highest mean values of the preceding month, noted over the middle plateau region; while the lowest mean readings for December, 1889, noted on the north Pacific coast, were about .15 lower than the lowest mean values for the preceding month, noted in Canada east of the eightieth meridian.

The mean pressure for December, 1889, was above the normal east of a line traced from the eastern extremity of Lake Superior southwestward to central Texas, while to the westward of this line the mean pressure was below the normal, except over the southeastern part of the southern plateau region. The greatest departures above the normal pressure occurred along the south Atlantic and Florida coasts, where they exceeded .10, and the most marked departures below the normal pressure were noted within an area extending from northern Nevada to and along the north Pacific coast, where they were more than .15. The abnormal distribution of mean pressure for the month is referred to in connection with the unprecedentedly high temperature for December, 1889, over the country east of the Rocky Mountains, in a discussion which appears under "Temperature of the air," in this issue of the REVIEW.

BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are shown in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. For December, 1889, the monthly ranges were greatest on the coast of extreme eastern New England, where they exceeded 2.10, whence they decreased southward to less than .20 over southern Florida, westward to less than 1.10 in the upper lake region, and the more northern stations in the upper Mississippi valley, whence they increased to more than 1.30 in the Missouri Valley, thence decreased to less than .70 over parts of the northeastern slope of the Rocky Mountains, and thence increased to more than 1.20 near the mouth of the Columbia River. On the Pacific coast the monthly ranges decreased from the Columbia Valley southward to southern California, where they were less than .50. Along the Atlantic coast the extreme monthly ranges varied from .18 at Key West, Fla., to 2.11 at Eastport, Me.; between the eighty-second and ninety-second meridians, .31 at Cedar Keys, Fla., to 1.29 at Manistee, Mich.; between the Mississippi River and the Rocky Mountains, .51 at Brownsville, Tex., to 1.31 at Concordia, Kans.; in the Rocky Mountain and plateau regions, .40 at Fort Grant, Ariz.,