

INFLUENCE OF SNOW COVER ON THE TEMPERATURE DISTRIBUTION IN UTAH, JANUARY, 1919.

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[Dated: Weather Bureau Office, Salt Lake City, Utah, Mar. 1, 1919.]

The January [1919] distribution of temperatures in Utah offers some unusual features which seem to be worthy of special notice, since they appear to illustrate a relation between snow cover and air temperature. Most of the northern part of the State, which was practically bare of snow throughout the month, had a January mean temperature above normal. The departures were especially marked along the extreme northeastern counties, adjoining Wyoming. This part of the State is separated from the remainder by two mountain ridges, namely, the northern spurs of the Wasatch Mountains, running north and south, and the Uinta Mountains, trending almost due east and west, with a general elevation of about 12,000 feet, one of the most important latitudinal ridges in the country. In previous years, the high and comparatively small valleys north and east of these ridges have always been covered with snow in January, so far as our records show, but this year they were bare, owing to the almost total lack of precipitation in December and January; and here two stations show temperature departures of more than 7° above normal. South of the Uintas is the semi-arid region drained by the Green and Colorado Rivers, a region which is frequently bare during much of the winter, but which this year had an unusually heavy snowfall in December, which remained on the ground throughout January. Here the temperature departures were all negative, some stations showing the coldest month of record. It was more than 18° below normal in eastern Emery and Wayne Counties, with surrounding stations from 6° to 9° below. These subnormal temperatures extended into the southwestern desert region of Millard, Beaver, and Iron Counties, which were not continuously snow covered, but the extreme southwestern counties, which were bare, were above normal. North of the Uintas, the station at Manila shows a departure of +7.3°, while 50 miles south on the southern slope, Fort Duchesne had a departure of -6.1°, and 70 miles southwest, Duchesne's departure was -9.6°, a difference of 16.9° as compared with the normals. Isograms of the temperature departures are drawn on the accompanying chart, (fig. 1), and the depth of snow on the ground at the end of the month is entered at the locations where observed.

This temperature distribution seems to present an excellent example of the influence of the snow-covered ground, frequently noted by students of forecasting,¹ in building up and retarding the Great Basin highs, which are a marked feature of winter conditions over the Plateau States. During January these highs were especially persistent over the snow-covered area of southeastern Utah and western Colorado, as shown by the daily reports from Grand Junction and Durango. On some occasions a small high area lingered for several days over this region, as shown by the weather maps of the 8th to 10th, inclusive, and the 15th to 19th, inclusive; while on other occasions, notably the 4th, 8th, 18th, and 28th, there was a small secondary high, seemingly the direct result of radiation.²

Larger causes resulted in a warm January in the States north and east of Utah, with the center of greatest departure in northeastern Montana, but the departures along the Utah-Wyoming border were greater than those farther north and east and the line of demarkation along the Uinta Mountains between the positive and negative departures was very distinct and abrupt. This abrupt change seems to be accounted for by the differing snow cover. The southern slope, though frequently bare, was this year covered with snow; hence

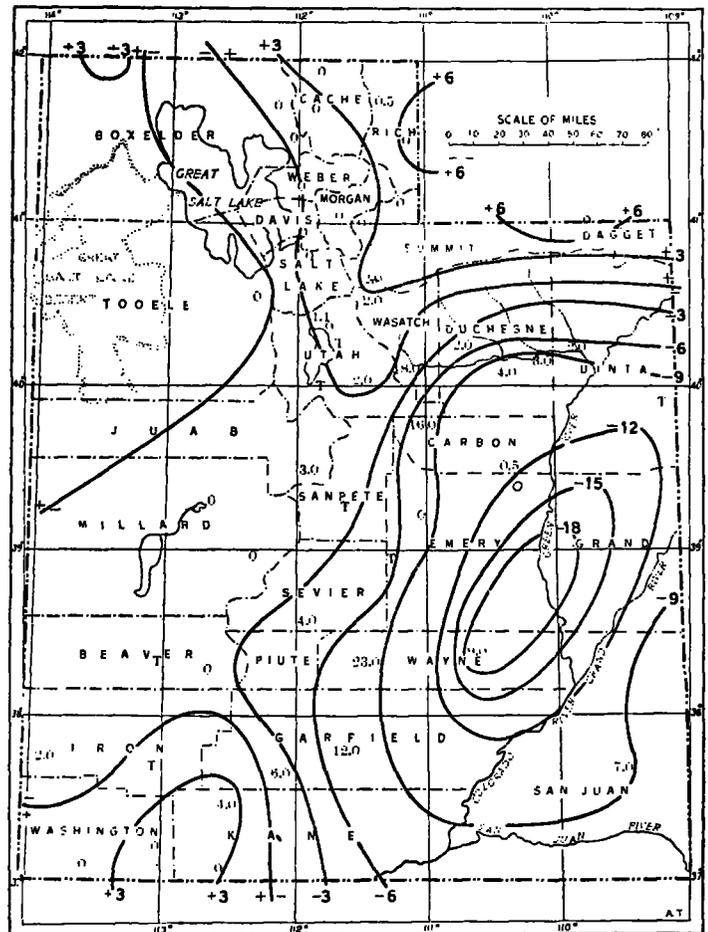


FIG. 1.—Isograms of temperature departures, and snow on the ground at end of month, Utah, January, 1919.

there was less than the usual warming by day and much more than the usual cooling of the air by night in the almost continuously clear weather, for this was the driest and clearest January of record in this region, with an average of but three cloudy days. But the northern slope, though generally snow-covered, was this year bare, and hence received more warming and less cooling than under average conditions. That the changes in night radiation during winter resulting from a snow cover or its absence are greater than those of daytime heating is indicated by the following table, showing

¹ Weather Forecasting in The United States, Washington, 1916: Henry, A. J., p. 133; Brandenburg, F. H., p. 322.
² On account of reductions to sea level, only the stronger highs shown on weather maps in the plateau States during cold winter weather, are truly anticyclones.—Error.

that the departures of the mean minimum were greater in most cases than those of the mean maximum on both the north and south slopes.

Departures of the mean maximum and the mean minimum from the normal at stations in eastern Utah during January, 1919.

[The first three stations are north of the divide; the others south.]

Station.	Snow on ground at end of month.	Mean maximum. °F.	Mean minimum. °F.
Laketown.....	0.5 in.	+ 2.1	+ 7.2
Manila.....	0	+ 6.9	+ 7.6
Woodruff.....	0	+13.2	+ 1.9
Blanding.....	7.0	- 8.7	- 9.4
Castle Dale.....	- 7.2	- 5.9
Duchesne.....	4.0	- 6.9	-13.5
Escalante.....	12.0	- 6.6	-10.8
Fort Duchesne.....	2.0	- 4.3	- 7.5
Green River.....	-16.5	-21.4
Hanksville.....	9.0	-21.2	-21.9

Possibly a chinook effect, for which the pressure distribution was favorable, was in part responsible for the high temperatures along the northern and eastern slopes of these ridges, though no decided chinook conditions are discernible in the daily temperatures. The idea is strengthened, however, by the fact that the departures were greater here than at some distance from the divide in southwestern Wyoming, which was also generally bare of snow. But this region, like southeastern Utah, is bare with sufficient frequency to have raised the normals, and it is believed that we have in the temperature distribution described above principally an illustration of the importance of snow cover in influencing local temperatures.*

THE EFFECT OF GUNFIRE ON THE RAINFALL OF THE BRITISH ISLES.

[Abstract reprinted from Geographical Review (New York), January, 1919, p. 51.]

A recent statement from Dr. H. R. Mill, director of the British Rainfall Organization, the leading authority on rainfall in the British Isles, gives an answer, as definite as is possible, to the much-discussed question of the effect of the gunfire in Europe upon the amount of precipitation in Great Britain (Symons's Meteorol. Mag., February, 1918). Two districts are selected, southeastern England, which was nearest to, and the northwestern district (comprising stations from Sutherland and the Hebrides to the west coast of Ireland), which was farthest from, the scene of the firing in Flanders. The monthly rainfalls from 1909 to 1917 are summarized in percentages of the average. In the period before the war there were 14 dry or very dry months in southeastern England and 12 wet or very wet months. During the war there were 12 dry or very dry and 13 wet or very wet months. A single month transferred from one category to the other would bring about an equality or even a reversal. In the northwest, in the same two periods, very dry months were equally numerous, and there were no very wet months. Taking dry and very dry months together, there were 7 before and 14 during the war, and of wet months there were 14 before and 15 during the war. Dr. Mill points out that much emphasis has been laid on the relative wetness of the years 1915 and 1916 in southeastern England, but this record should be considered in connection with the fact that the year 1917, when the war was in a very intense phase, had a nearly normal rainfall.—R. DE C. WARD.

* For other recent discussions of the influence of snow-cover on air temperature, see Mo. Wea. Rev. 1917, 45: 272; and 1918, 46: 570-580.—Ebrton.