

TABLE 3.—Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a. m. (E. S. T.) during January, 1931—Continued

	Memphis, Tenn. (145 meters)		Modena, Utah (1,665 meters)		New Orleans, La. (25 meters)		Omaha, Nebr. (299 meters)		Phoenix, Ariz. (356 meters)		Royal Center, Ind. (225 meters)		Salt Lake City, Utah (1,294 meters)		San Francisco, Calif. (8 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (14 meters)		Spokane, Wash. (606 meters)		Washington, D. C. (10 meters)		
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	
Surface.....	S 68 W	0.9	S 81 W	2.4	N 19 E	0.9	W 70 W	0.9	S 71 E	3.7	S 63 W	2.5	S 40 E	0.7	S 77 E	0.8	N 31 E	0.5	S 45 E	1.5	S 15 E	0.8	N 53 W	1.4	
500.....	N 79 W	4.6	-----	-----	N 5 W	4.1	N 70 W	3.8	S 84 E	3.7	S 87 W	7.1	-----	-----	N 33 E	2.0	N 66 W	1.0	S 8 W	7.0	-----	-----	N 67 W	7.5	
1,000.....	N 69 W	6.1	-----	-----	N 29 W	4.1	N 61 W	8.5	N 82 E	5.9	N 78 W	7.7	-----	-----	N 30 E	1.6	N 57 W	6.3	S 15 W	8.3	S 19 W	3.4	N 67 W	9.8	
1,500.....	N 88 W	7.1	-----	-----	N 53 W	4.5	N 67 W	10.9	N 80 E	4.4	N 87 W	12.4	S 16 E	1.4	N 47 W	0.8	N 48 W	9.2	S 33 W	7.7	S 51 W	2.7	N 73 W	11.5	
2,000.....	N 83 W	7.1	N 57 E	1.9	N 69 W	4.2	N 67 W	11.7	N 73 E	1.1	N 87 W	13.4	S 11 W	3.1	N 35 W	1.7	N 53 W	12.6	S 36 W	7.1	S 65 W	10.0	N 77 W	10.3	
2,500.....	N 85 W	10.3	N 71 E	3.2	N 70 W	3.7	N 69 W	13.0	N 16 W	0.9	N 86 W	13.6	S 41 W	1.9	N 41 W	1.9	N 54 W	14.1	S 66 W	7.1	S 66 W	10.0	N 84 W	8.9	
3,000.....	N 87 W	11.7	N 59 W	3.6	N 61 W	3.6	N 60 W	14.8	N 69 W	0.9	N 66 W	13.6	N 79 W	3.0	N 39 W	1.6	N 57 W	16.0	S 76 W	6.9	S 68 W	9.2	-----	-----	
4,000.....	-----	-----	-----	-----	-----	-----	-----	-----	N 39 W	7.4	-----	-----	S 78 W	1.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
5,000.....	-----	-----	N 49 W	5.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	

TABLE 4.—Observations by means of kites, captive and limited height sounding balloons during January, 1931

	Broken Arrow, Okla.	Due West, S. C.	Ellendale, N. Dak.	Groesbeck, Tex.	Royal Center, Ind.
Mean altitudes, meters m. s. l., reached during month.....	2,823	2,640	2,997	2,561	2,895
Maximum altitude, meters m. s. l., reached.....	4,032	5,123	4,518	3,938	6,209
Number of flights made.....	31	33	29	21	28
Number of days on which flights were made.....	28	29	29	21	28

In addition to the above, there were approximately 176 scheduled pilot balloon observations made daily at 60 weather bureau stations in the United States.

WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By M. C. BENNETT

GENERAL SUMMARY

The month of January was abnormally warm and dry. However, in the extreme southern portions of the country, the more northeastern States, and the central Plateau the temperature averaged below normal. Elsewhere the month was generally warm, especially in the area between the Great Lakes and Rocky Mountains, where the monthly means were from 12° to 19° above the average.

The precipitation for the month was heavy in much of Texas, and normal or above in the Gulf section including Florida, and in the south Pacific districts and parts of Washington. Elsewhere the falls were generally scanty, with large areas continuing remarkably dry. In practically all central valley sections, and generally in the Great Plains, much of the Rocky Mountain region, and the central Plateau less than half the normal was received.

TEMPERATURE

The eastern and south-central portions of the country were experiencing moderately cool weather at the beginning of January, and in the coast districts from the Carolinas to the Rio Grande, likewise in the southern Appalachians and the lower Mississippi Valley, the low temperatures prevailed without material interruption until about the 22d. Conditions varied more in the Northeast and from the Ohio Valley northward, but the first three weeks were mainly milder than normal in these sections, especially in the middle and western portions of the Lake region.

From the middle and upper Mississippi Valley westward over the Plains to the Rocky Mountains decidedly mild weather prevailed during the first three weeks, except for a brief cold period about the 12th to 14th. West of the divide there was usually warm weather in the

Pacific States, but cold weather in a large part of the Plateau region.

The last 10 days of January were unseasonably warm in most districts, only a small area centering in northern Utah and a larger area covering nearly all of New York and New England, having colder weather than normal. Remarkably high temperatures for January were noted from the North Pacific States to Lake Superior and over the Plains and the central valleys. New high marks for January were noted at several stations during the last five days of the month.

The month resembled December just before it, being far warmer than normal in the north-central portion of the country and cooler than normal in the Southeast and in large portions of the Rio Grande Valley and the Plateau. Unlike December, January was warmer than normal in the Middle Atlantic States, the Ohio Valley, northern and central Texas, nearly all of Colorado, Nevada, and Idaho, and practically every part of the Pacific States. Only Utah and Florida sections averaged more than 2° colder than normal. Minnesota and the Dakotas averaged 13° to 15° warmer than normal, and over most North-central States this was the warmest January of record, or the warmest save 1880.

In California and Florida the highest temperatures came during the first week, but in almost every other State during the closing week. The lowest marks in the far West came during the opening decade, but from the Plains southeastward to the south Atlantic coast very near the middle of the month.

PRECIPITATION

The first eight days brought much precipitation in the Pacific States, and about the 11th there was considerable in Texas. The east Gulf and Atlantic regions received important amounts about the 5th, and substantially all their month's supply during the period from the 4th to the 18th. For almost all the country the last fortnight of January was without important precipitation.

The month was decidedly dry over the country as a whole. In this it resembled December just preceding, and, like December, there were moderate excesses in Florida and much of Texas. Unlike December, January brought more than normal precipitation to most of southern California and to Washington.

While the Gulf coast section had about as much rain as normal and the Lake region reported but a slight precipitation deficiency, yet most of the great area between the Rocky Mountain and Appalachian Divides had a marked deficiency, especially the middle and lower Ohio Valley, northern Arkansas, the Dakotas, and Minnesota. The middle and southern Plateau and the Middle Atlantic States likewise had considerable shortages.

As a result of the long-continued deficiency of precipitation, the major portions of the Mississippi and some other rivers were reported at the lowest stages ever known in midwinter.

Southwestern Texas, in marked contrast to a great part of the country, received more than three times the normal January rainfall, while in Florida, January, with about 120 per cent of normal, was the third successive month of more than normal rainfall.

SNOWFALL

There have been few Januarys with less snowfall, taking the country as a whole. The southern Middle Atlantic States, Ohio Valley, Minnesota and practically all the Plains had decidedly small amounts, compared with their average January quantities.

From eastern Iowa eastward and northeastward over the Lake region there was not so marked a deficiency; and

New York, save the southeastern part, and almost all of New England had considerably more than normal snowfall. In New York no January since 1925 has brought so much snowfall as the present one, and the New England average amount for this month has been exceeded in January only three times within the last quarter century.

Most of the far West reported a considerable shortage of snowfall, compared with the expected quantity. The supply of stored snow in the higher portions is small, on the whole; it is usually least unsatisfactory near and for a moderate distance to westward of the Continental Divide, between the Canadian boundary and the central portions of Colorado and Utah.

The ground was bare to an extraordinary extent over the northern Plains and westward to the foothills of the Rockies, also in southern Minnesota and from Kansas and Missouri eastward over the Ohio Valley.

SUNSHINE AND RELATIVE HUMIDITY

Much cloudy weather prevailed in the region of the Great Lakes and upper Ohio Valley, southern Florida, the far Northwest and northern Pacific States, while in the western portion of the Great Plains much sunny weather prevailed, western North Dakota receiving about 70 per cent of the possible. Elsewhere about the normal amounts of sunshine were received. The relative humidity was generally above the normal in Texas and portions of the adjacent States, in much of the Great Basin and Plateau region, and portions of the Lake region and northern New England, while elsewhere it was generally near or below the normal. However, the departures from the normal were nowhere large.

SEVERE LOCAL STORMS, JANUARY, 1931

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Unlontown, Pa., and vicinity.	5	Noon	3,520		\$100,000	Severe wind	Many buildings unroofed, some completely wrecked; overhead wires torn down; plate glass broken; many minor injuries.	Official, U. S. Weather Bureau.
Caswell County, N. C. (4 miles north of Yanceyville).	5	4 p. m.	200-300		10,000	Tornado	Number of buildings demolished, others unroofed; 2 persons injured; path 10 miles long.	Do. News and Observer (Raleigh N. C.).
Warren County, N. C. (3 miles west of Wise).		4.35 p. m.	100-200	6	35,000	Do.	Farm buildings, a training school, and 2 churches demolished; poultry killed; trees uprooted or twisted off; path 4 miles long.	Official, U. S. Weather Bureau.
Mecklenburg County, Va. (near Boydton).		5 p. m.	100	1	3,500	Do.	House and other buildings blown down; path 2 miles long.	Do. Washington Post (D. C.).

RIVERS AND FLOODS

By RICHMOND T. ZOCH

Floods in January, 1931, were local and of very minor importance. They occurred in the Santee, Savannah, and West Pearl Rivers, as shown in the following table.

An interesting occurrence in January, 1931, was the formation of an ice sheet at Saltair, near Salt Lake City, on Great Salt Lake. The sheet was observed on the morning of the 6th; it was about one-fourth inch thick, began at the shore, and extended out about 1,000 feet. This is the first known instance of the formation of ice on the open lake; a possible explanation of the cause of the freezing is given by Herman Harms, Utah State chemist, as follows:

The prolonged cold spell has caused an unusually heavy precipitation of Glauber salts, one of the chief constituents next to sodium chloride. This has decreased the density of the water to such an extent as to permit freezing over the shallow water near the shore. The ordinary freezing point of Great Salt Lake water, which is nearly 23 per cent solid, would be from 20° to 25° below zero. With the density decreased by Glauber salts precipitation, however, the freezing point would be raised about 10°.

The freezing of Bear River Bay, a part of the lake, is said not to be unusual, but is due to an artificial condition. The embankment of the Lucin cut-off has almost completely separated Bear River Bay from the main body of the lake, and the water from Bear River freshens the bay water to an extent sufficient to allow freezing to take place. Also, considerable ice from Jordan River floats into the lake occasionally.

Table of flood stages in January, 1931

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC DRAINAGE					
Santee:	Feet			Feet	
Rimini, S. C.	12	20	22	12.2	22
Ferguson, S. C.	12	10	12	12.1	12
		14	25	12.7	18-19
Savannah: Ellenton, S. C.	13	8	11	14.3	9
		14	23	17.3	16
EAST GULF DRAINAGE					
West Pearl: Pearl River, La.	13	12	24	14.7	18