

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1928—Continued							
May 28 (Naval Observatory).	11 36	-76.5	192.2	+9.0	-----	216	-----
		-69.0	199.7	-12.5	-----	617	-----
		-50.5	218.2	-11.0	-----	93	-----
		-41.5	227.2	-10.0	-----	62	-----
		-16.5	252.2	+9.0	-----	46	-----
		+12.5	281.2	+12.5	-----	185	-----
		+15.0	283.7	-17.0	-----	77	-----
		+21.0	289.7	-18.5	-----	123	1,419
May 29 (Naval Observatory).	12 13	-74.0	181.1	-15.5	-----	139	-----
		-68.0	187.1	+9.0	-----	77	-----
		-61.0	194.1	+9.0	-----	185	-----
		-56.0	199.1	-12.5	-----	741	-----
		-44.5	210.6	+10.0	-----	62	-----
		-38.0	217.1	-10.5	-----	46	-----
		-28.0	227.1	-10.0	-----	62	-----
		-2.5	252.6	+9.0	-----	31	-----
		+26.5	281.6	+12.0	-----	185	-----
		+29.0	284.1	-17.0	-----	62	-----
		+34.5	289.6	-19.0	-----	185	1,775

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1928—Continued							
May 30 (Naval Observatory).	11 48	-60.5	181.6	-15.5	-----	154	-----
		-54.0	188.1	+9.0	-----	46	-----
		-48.0	194.1	+9.0	-----	139	-----
		-43.5	198.6	-12.5	-----	648	-----
		-30.0	212.1	+10.0	-----	123	-----
		-24.0	218.1	-10.0	-----	46	-----
		-15.5	226.6	-10.5	-----	77	-----
		+10.0	252.1	+9.0	-----	25	-----
		+37.5	279.6	+12.0	-----	93	-----
		+41.0	283.1	-17.0	-----	62	-----
		+43.5	285.6	+13.5	-----	62	-----
		+47.5	289.6	-19.0	-----	108	1,583
May 31 (Naval Observatory).	11 46	-47.0	181.9	-16.0	-----	123	-----
		-40.0	188.9	+8.5	-----	40	-----
		-34.5	194.4	+9.0	-----	154	-----
		-29.5	199.4	-13.0	-----	586	-----
		-20.0	206.9	+10.5	-----	62	-----
		-14.5	214.4	+8.5	-----	46	-----
		-9.0	219.9	+10.5	-----	31	-----
		-1.0	227.9	+10.5	-----	93	-----
		+23.0	251.9	+9.0	-----	31	-----
		+50.0	278.9	+12.0	-----	77	-----
		+55.0	283.9	-17.0	-----	62	-----
		+58.0	286.9	+13.0	-----	93	-----
		+63.0	291.9	-19.0	-----	93	1,491
Mean daily area for May.							912

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

As indicated in Table 1 the average free-air temperatures for May were close to normal with the exception of Ellendale where moderately large positive departures occurred at all levels. Relative humidity departures were mostly negative, those at Ellendale being of considerable magnitude. Notwithstanding the supernormal temperatures at this station the vapor pressures averaged appreciably below normal. This is of significance in connection with the pronounced lack of precipitation during the month at Ellendale, the total being only 0.67 inch as compared to a normal of 2.80 inches.

Marked deficiencies in the free-air vapor pressures at Groesbeck likewise are of interest in connection with the dryness of the month, 63 per cent of the total rainfall at this station having fallen during one hour on the 20th. It will also be noted that, at this station, the free-air relative humidity averaged below normal as did the temperature, a relationship which might be expected to result in less than normal precipitation.

Of special interest in Table 2 are the northerly components which occurred in the resultant winds for the month at Ellendale as compared to the normal southerly component notwithstanding the fact that the temperature departures at this station were positive. At the other stations the resultant winds for the month as compared with their normals were in general agreement with the temperature departures, i. e., an excess of southerly components occurred with positive temperature departures and vice versa.

Easterly winds at high elevations in the middle latitudes indicate abnormal conditions and it is interesting therefore to note such a wind movement over the interior of the country between May 20 and 24. During this period a high pressure area settled down over the Great Plains States, its center moving slowly southward with practically no eastward component. With this relatively cold air over the Southern Plains States and western Gulf region winds over the Mississippi and Ohio Valleys were northerly in the lower levels and veered with altitude to northeasterly at 5,000 meters and higher.

At Knoxville on the 22d the wind was due east from 1,000 to 4,500 meters and southeast to 8,000 meters. During this period a low pressure area formed over the Gulf States and with the lack of eastward movement in the general circulation this storm developed to considerable intensity and produced widespread precipitation over this region.

Special pilot balloon observations from a number of stations were dispatched to Pittsburgh in connection with the elimination balloon race of May 30. A severe thunderstorm enveloped most of the balloons shortly after the take-off and only 3 out of 14 escaped the storm and made safe landings in Virginia. Lightning struck three balloons causing the death of two men and the injury of several others. Exceptionally strong vertical currents were encountered by the balloons in this storm. A study of these conditions will be published at a later time.

TABLE 1.—Free-air temperatures, relative humidities and vapor pressures during May, 1928

Altitude M. S. L. (meters)	TEMPERATURE (° C.)											
	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Washington, D. C. (7 meters)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	20.0	+0.2	19.9	-0.5	15.0	+1.7	22.2	-0.4	16.3	-0.1	19.6	+1.6
250	19.9	+0.2	19.6	-0.5	14.6	+1.7	21.5	-0.3	15.9	-0.2	18.8	+1.6
500	19.4	+0.5	17.6	-0.1	14.0	+2.2	18.2	-0.3	14.4	+0.0	14.1	+0.6
750	17.0	+0.1	16.2	+0.1	13.4	+2.2	17.1	-0.3	12.3	+0.3	12.1	+0.7
1,000	16.1	+0.4	14.7	+0.1	11.9	+1.8	15.0	-0.3	10.5	+0.3	11.2	+0.7
1,250	15.4	+0.8	13.1	+0.1	10.1	+1.8	13.1	-0.3	9.5	+0.3	9.9	+0.8
1,500	14.8	+0.8	11.5	+0.2	8.9	+1.3	12.7	-0.3	8.9	+0.3	8.1	+1.0
2,000	11.6	+0.8	8.7	+0.5	6.0	+1.3	10.0	-0.3	6.1	+0.3	5.4	+1.1
2,500	8.4	+0.4	6.0	+0.5	4.1	+1.3	8.7	-0.3	5.1	+0.3	4.1	+1.1
3,000	5.1	+0.2	3.0	+0.5	2.1	+1.6	6.7	-0.3	3.3	+0.1	3.6	+0.8
3,500	1.6	-0.1	0.1	+0.2	0.8	+1.6	3.3	-0.3	0.3	+0.1	0.6	+1.4
4,000	-0.2	+1.1	-2.6	-0.1	-5.7	+2.2	0.3	-1.1	-5.9	-0.1		
4,500	-3.6	+0.7	-6.8	-0.1	-10.1		-3.1	-1.1	-8.5	0.0		
5,000	-5.8	+0.8	-10.3	-0.2			-5.9	-1.9				

1 Naval Air Station.

TABLE 1.—Free-air temperatures, relative humidities and vapor pressures during May, 1928—Continued

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Table with columns for stations: Broken Arrow, Okla. (233 meters), Due West, S. C. (217 meters), Ellendale, N. Dak. (444 meters), Groesbeck, Tex. (141 meters), Royal Center, Ind. (225 meters), Washington, D. C. (7 meters). Rows include Altitude M. S. L. (meters) and Mean/Departure from normal for temperature and relative humidity.

Table with columns for stations: Broken Arrow, Okla. (233 meters), Due West, S. C. (217 meters), Ellendale, N. Dak. (444 meters), Groesbeck, Tex. (141 meters), Royal Center, Ind. (225 meters), Washington, D. C. (7 meters). Rows include Altitude M. S. L. (meters) and Mean/Departure from normal for temperature and vapor pressure.

TABLE 2.—Free-air resultant winds (m. p. s.) during May, 1928

Table with columns for stations: Broken Arrow, Okla. (233 meters), Due West, S. C. (217 meters), Ellendale, N. Dak. (444 meters), Groesbeck, Tex. (141 meters), Royal Center, Ind. (225 meters), Washington, D. C. (34 meters). Rows include Altitude m. s. l. (meters) and Mean/Normal wind direction and velocity.

THE WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By P. C. DAY

GENERAL CONDITIONS

The month was notably free from extensive or widespread short-period variations, being almost continually warm in the western two-thirds and largely cool in the eastern third, with an important deficiency in precipitation over many districts.

PRESSURE AND WINDS

The pressure distribution was somewhat of the anticyclonic type, the area of highest pressure, slightly above 30 inches, being central over the far Northwest, a ridge extending southeastward to the Florida Peninsula, the averages diminishing slightly to the southwestward, but with little if any change northward toward the Canadian Provinces.

cyclones attended by precipitation of importance occurred during that period, though local precipitation, heavy in a few instances, occurred on the 4th and 5th from the southern plains northeastward to the Great Lakes, and again on the 7th and 8th along the Atlantic coast from northern Florida to southern New England, and local showers were quite frequent during the early part of the second decade from the southern Plateau eastward to the plains of Texas, Oklahoma, and Kansas.

By the 15th the general rainy conditions in the Southwest had developed into a considerable barometric depression over the middle plains, which advanced eastward into the central valleys and to the Great Lakes by the 17th. This was attended by showers with local heavy thunderstorms over the region covered and for the following few days showers occurred over wide areas from the Great Plains eastward.

About the 22d, conditions favoring thunderstorms overspread the central Gulf States and during the following few days some heavy rains occurred over the Southeastern States. These were quickly followed by a stormy condition central on the morning of the 25th near the lower Lakes, which, advancing southeastward over