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	
1930	h m	°	°	°			
Jan. 14 (Perkins)	16 25	−48.2	270.0	+15.3		465	
		+30.1	348.3	−2.5	211		
		+32.4	350.6	−4.9	146		
		+33.5	351.7	+6.6	1,234		2,056
Jan. 15 (Perkins)	13 19	−58.0	248.8	+13.7	93		
		−46.5	260.3	−14.6		183	
		−34.4	272.4	+14.8		1,048	
		−9.1	297.7	−12.9		93	
		+41.5	348.3	−3.0	546		
		+44.0	350.8	−5.3	217		
		+45.6	352.4	+6.4	1,203		3,383
Jan. 16 (Naval Observatory).	11 20	−80.5	214.5	+11.5	123		
		−56.0	239.0	−10.0	6		
		−46.0	249.0	+14.5		62	
		−31.5	263.5	−13.5		77	
		−22.5	272.5	+15.0		772	
		+0.5	295.5	−12.5		22	
		+25.0	320.0	−17.0		15	
		+41.5	336.5	+18.0		62	
		+44.0	339.0	+11.0		77	
		+55.0	350.0	−3.0		417	
		+58.0	353.0	+6.5	386		2,019
Jan. 17 (Naval Observatory).	11 31	−77.0	204.7	+14.5		154	
		−68.5	213.2	+10.5	93		
		−42.0	239.7	−10.5	6		
		−32.0	249.7	+14.0	46		
		−19.5	262.2	−13.5		77	
		−8.5	273.2	+14.5		694	
		+14.0	295.7	−12.0		40	
		+40.5	322.2	−15.5		46	
		+68.5	350.2	−2.5		324	
		+71.0	352.7	+6.5	370		1,850
Jan. 18 (Mount Wilson)	12 35	−73.0	195.0	+16.0	63		
		−60.0	208.0	+14.0		19	
		−52.0	216.0	+10.0	58		
		−25.0	243.0	−11.0	2		
		−20.0	248.0	+13.0		23	
		−5.0	263.0	−15.0		21	
		+5.0	273.0	+13.0		458	
		+28.0	296.0	−13.0		2	
		+55.0	323.0	−18.0		18	
		+85.0	353.0	−4.0	249		
		+87.0	355.0	−5.0	52		
		+88.0	356.0	+6.0	73		1,038
Jan. 19 (Naval Observatory).	11 40	−51.0	204.3	+14.0		231	
		−6.5	248.8	+13.5	6		
		+6.5	261.8	−13.5		77	
		+19.5	274.8	+14.0		525	839
Jan. 20 (Naval Observatory).	11 29	−37.5	204.7	+14.0		201	
		+6.5	248.7	+13.5	6		
		+12.5	254.7	−15.5	15		
		+33.0	275.2	+14.0		525	
		+84.0	326.2	−14.0	62		809
Jan. 21 (Mount Wilson)	13 15	−80.0	148.1	+12.0		142	
		−35.0	193.1	+15.0		87	
		−23.0	205.1	+14.0		10	
		−14.0	214.1	+10.0	4		
		+20.0	248.1	+13.0	15		
		+27.0	255.1	−15.0		3	
		+45.0	273.1	+13.0		221	482
Jan. 22 (Mount Wilson)	12 30	−70.0	145.4	+12.0		408	
		−22.0	193.4	+15.0		42	
		−10.0	205.4	+14.0		15	
		−1.0	214.4	+11.0	1		
		+34.0	249.4	+14.0	4		
		+62.0	277.4	+13.0		63	533
Jan. 23 (Naval Observatory).	11 31	−54.0	148.7	+12.5		463	
		−3.5	199.2	+12.0		108	
		+74.0	276.7	+12.5		154	725

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	
1930	h m	°	°	°			
Jan. 24 (Naval Observatory).	11 30	−41.5	148.1	+12.5		370	
		+6.0	195.6	+15.0		77	
		+48.5	238.1	−15.0		12	459
Jan. 25 (Naval Observatory).	11 33	−70.0	106.4	+17.0	31		
		−28.5	147.9	+12.0		293	
		+19.0	195.4	+15.0		62	386
Jan. 26 (Naval Observatory).	11 34	−43.5	119.7	+17.0	12		
		−14.5	148.7	+12.0		247	
		+32.5	195.7	+14.0		77	336
Jan. 27 (Yerkes)	16 44	−29.0	118.3	+17.0	16		
		−26.0	121.3	+17.5	20		
		+1.5	148.8	+12.5		384	420
Jan. 28 (Naval Observatory).	14 3	−74.5	61.0	+7.0	123		
		−15.5	120.0	+16.5		46	
		+13.0	148.5	+12.0		185	354
Jan. 29 (Mount Wilson)	13 35	−62.0	60.7	+8.0	101		
		−26.0	96.7	+7.0		11	
		−4.0	118.7	+17.0		69	
		+26.0	148.7	+11.0		37	
		+45.0	167.7	+4.0	5		223
Jan. 30 (Mount Wilson)	13 45	−81.0	28.4	+21.0	189		
		−47.0	62.4	+7.0	72		
		−12.0	97.4	+7.0		9	
		+11.0	120.4	+17.0		147	
		+40.0	149.4	+11.0		99	
		+61.0	170.4	+5.0		28	544
Jan. 31 (Naval Observatory).	11 58	−61.5	35.7	+19.5		324	
		−34.5	62.7	+6.5	123		
		+21.5	118.7	+17.5		201	
		+53.0	150.2	+11.0		170	
		+73.0	170.2	+5.5		93	911
Mean daily area for January							962

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR JANUARY, 1930 [1]

[Data furnished through the courtesy of Prof. W. Brunner, University of Zurich, Switzerland]

January, 1930	Relative numbers	January, 1930	Relative numbers	January, 1930	Relative numbers
1	37	11	Ec 65	21	d 76
2	d 42	12	bbd 67	22	60
3	55	13	a 91	23	65
4	38	14	89	24	a 49
5	49	15		25	39
6	d 55	16		26	34
7	a 62	17	107	27	Eac 31
8	a 68	18	b 137	28	
9	62	19	97	29	62
10	57	20	63	30	d
				31	62

Mean, 27 days=63.7.

[1] Dependent alone on observations at Zurich and its station at Arosa.
a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a large or average-sized center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

By RICHMOND T. ZOCH

Free-air temperatures were below normal at all stations except Due West, where they were above normal. (Table 1.) At most levels the negative departures at Ellendale, Broken Arrow, and Groesbeck were the greatest on record. This is significant in that the surface temperatures at Broken Arrow and Groesbeck show that these stations had the coldest Januarys on record, both stations establishing new absolute minimum temperatures. However, the mean temperature at Ellendale was slightly above the mean temperature of that station for January, 1929. In marked contrast, Due West had the warmest January on record and established a new absolute maximum for that month.

Free-air relative humidities were above normal at all levels at Broken Arrow, Ellendale, and Royal Center but below normal at most levels at Groesbeck and Due West. Vapor pressures were below normal with very few exceptions.

The free-air conditions, i. e., temperature, relative humidity, vapor pressure, and resultant winds over

Ellendale were strikingly similar to those of January, 1929, yet while January, 1929, had the greatest precipitation on record this month was one of the dryest Januarys for that station. However, the cloudiness was somewhat greater than for January, 1929, and the reason for these clouds producing scant precipitation this year can be explained by differing pressure distribution, the increased coludiness itself preventing observations to indicate differing resultant winds.

The resultant winds were variable in the lower levels throughout the United States. In the higher levels they were westerly. (Table 3.)

In addition to the flights given in Table 4, a special sounding balloon series was made at 10 regular Weather Bureau stations.

As explained in the December, 1929, Summary, Table 2 is not closely comparable with Table 1.

TABLE 2.—*Free-air data determined at naval air stations during January, 1930*

Altitude (meters) m. s. l.	Temperature (° C.)			Relative humidity (%)		
	Pensacola, Fla.	San Diego, Calif.	Washington, D. C.	Pensacola, Fla.	San Diego, Calif.	Washington, D. C.
Surface	10.3	14.0	2.7	86	63	80
500	10.6	11.7	3.9	75	62	76
1,000	10.1	10.0	3.5	63	57	69
2,000	8.1	5.8	1.3	45	47	63
3,000	4.4	1.7	−1.3	37	31	53
4,000			−7.6			45

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during January, 1930*

Altitude (meters) m. s. l.	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)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
TEMPERATURE (° C.)										
Meters										
Surface	−4.5	−7.7	5.4	−0.3	−17.4	−6.3	2.0	−6.0	−7.8	−3.5
500	−4.8	−7.6	5.4	0	−17.5	−6.5	0.3	−7.2	−9.1	−3.7
1,000	−3.6	−6.3	5.0	+0.4	−16.9	−8.1	2.4	−4.9	−8.9	−3.6
1,500	−2.9	−5.3	3.7	+0.6	−16.6	−8.5	2.7	−3.7	−9.2	−3.4
2,000	−3.6	−4.6	1.9	+0.7	−17.1	−7.5	1.7	−3.0	−10.1	−3.3
2,500	−4.9	−3.7	−0.1	+0.7	−18.1	−6.3	0.4	−2.2	−11.0	−2.3
3,000	−7.5	−3.8	−1.9	+1.0	−19.9	−5.5	0.3	0.0	−13.0	−2.0
4,000	−12.8	−3.6	−6.1	+1.8						
RELATIVE HUMIDITY (%)										
Surface	76	+6	72	+3	84	+3	78	+1	84	+5
500	71	+7	61	−1	84	+5	71	+1	80	+6
1,000	65	+10	56	−1	80	+14	57	−4	69	+6
1,500	58	+12	50	−3	76	+17	55	+2	66	+10
2,000	55	+14	42	−7	75	+17	46	−2	65	+14
2,500	50	+10	41	−4	71	+13	35	−10	68	+16
3,000	49	+9	32	−10	65	+7	16	−25	66	+13
4,000	50	+8	26	−14						
VAPOR PRESSURE (*mb.*)										
Surface	3.69	−1.99	7.06	+0.28	1.41	−0.99	6.79	−2.07	3.13	−0.68
500	3.44	−1.62	6.06	−0.04	1.39	−0.96	5.52	−2.28	2.69	−0.62
1,000	3.28	−0.92	5.36	0.00	1.28	−0.87	4.87	−1.63	2.20	−0.59
1,500	2.84	−0.53	4.11	−0.26	1.17	−0.80	4.29	−0.94	2.03	−0.30
2,000	2.47	−0.27	2.92	−0.60	1.06	−0.64	2.89	−1.29	1.80	−0.12
2,500	2.05	−0.25	2.43	−0.29	0.91	−0.48	1.62	−1.75	1.68	+0.03
3,000	1.74	−0.21	1.61	−0.50	0.69	−0.39	0.36	−2.30	1.45	+0.01
4,000	1.32	−0.09	1.25	−0.13						

TABLE 3.—*Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a. m. (E. S. T.) during January, 1930*

Altitude (meters) m. s. l.	Broken Arrow, Okla. (233 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,868 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck Tex. (141 meters)		Havre, Mont. (762 metes)		Jacksonville, Fla. (65 meters)		Key West, Fla. (11 meters)		Los Angeles, Calif. (40 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°	
Surface	N 11 W	0.5	S 20 W	2.7	W	3.7	N 44 E	1.0	N 51 W	2.8	N 9 E	0.3	S 83 W	2.0	N 12 E	1.6	N 45 E	2.1	N 73 W	2.7
500	S 40 W	0.5	S 41 W	5.8			N 14 W	1.4	N 49 W	3.8	N 13 E	1.5			N 79 E	2.3	N 86 E	5.9	S 84 E	0.7
1,000	S 86 W	3.3	S 70 W	7.9			S 80 W	2.8	N 40 W	6.0	N 64 W	1.4	N 82 W	5.1	S 33 E	2.8	S 72 E	6.1	S 52 E	1.1
1,500	N 74 W	5.2	S 85 W	10.9			S 76 W	6.0	N 46 W	7.2	N 67 W	4.3	N 59 W	6.7	S 13 W	1.0	S 54 E	4.6	N 53 E	1.3
2,000	N 61 W	7.7	N 89 W	14.1	S 87 W	5.8	S 80 W	7.9	N 53 W	8.7	N 62 W	4.8	N 60 W	8.3	S 60 W	2.4	S 15 E	3.0	N 69 W	1.7
2,500	N 60 W	9.9	N 88 W	14.3	N 79 W	8.3	S 77 W	11.2	N 63 W	11.6	N 67 W	6.3	N 67 W	10.2	S 80 W	5.4	S 6 W	3.3	N 68 W	4.4
3,000	N 61 W	11.8	N 83 W	17.8	N 72 W	9.9	S 59 W	11.5	N 62 W	13.5	N 76 W	8.4	N 68 W	10.3	S 87 W	7.4	S 27 W	3.1	N 60 W	7.0
4,000			N 83 W	23.4	S 82 W	10.4	S 74 W	17.2	N 71 W	14.4					N 79 W	8.3	S 55 W	8.5	N 53 W	7.5
5,000															N 75 W	8.6				

Altitude (meters) m. s. l.	Medford, Oreg. (446 meters)		Memphis, Tenn. (145 meters)		New Orleans, La. (25 meters)		Omaha, Nebr. (313 meters)		Royal Center, Ind. (225 meters)		Salt Lake City, Utah (1,280 meters)		San Francisco, Calif. (60 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (67 meters)		Washington, D. C. (34 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°	
Surface	S 8 W	0.6	N 4 W	1.3	N 52 E	1.7	N 32 W	1.7	S 45 W	2.3	S 59 E	0.9	N 88 E	1.5	S 70 W	0.9	S 55 E	0.5	N 5 W	1.0
500	S 67 W	0.1	N 56 W	1.8	S 49 E	4.2	N 45 W	4.8	S 65 W	5.4			E	0.5	S 83 W	4.8	S 69 E	1.0	S 76 W	6.2
1,000	S 40 E	2.9	N 51 W	4.1	S 17 E	2.2	N 41 W	6.3	S 73 W	9.4			N 52 W	1.6	N 80 W	6.8	S 84 E	2.8	S 78 W	9.3
1,500	S 31 W	4.0	N 69 W	6.9	S 87 W	2.5	N 64 W	7.8	N 86 W	9.8	S 9 E	3.5	S 85 W	3.4	N 69 W	8.3	S 83 E	1.3	S 82 W	11.5
2,000	S 52 W	6.2	N 71 W	11.0	S 60 W	2.9	N 68 W	10.1	N 69 W	13.7	S 7 W	3.7	S 72 W	2.7	S 85 W	7.2	N 77 E	0.6	N 88 W	13.2
2,500	S 68 W	6.7			S 73 W	7.3	N 83 W	10.1	N 78 W	14.8	S 47 W	4.2	S 84 W	2.9			N 19 E	1.0		
3,000	N 86 W	7.8					N 88 W	11.2			N 79 W	5.0	N 62 W	4.2			N 58 E	6.6		
4,000	N 73 W	7.8					S 86 W	12.8			N 81 W	9.3								

TABLE 4.—*Observations by means of kites, captive and limited-height sounding balloons during January, 1930*

	Broken Arrow, Okla.	Due West, S. C.	Ellendale, N. Dak.	Groesbeck, Tex.	Royal Center, Ind.
Mean altitudes (meters), M. S. L., reached during month	2,513	2,442	2,936	1,990	2,089
Maximum altitude (meters), M. S. L., reached and date	[1] 4,270	[2] 4,134	[2] 3,981	[3] 3,077	[4] 3,234
Number of flights made	26	30	39	28	27
Number of days on which flights were made	22	26	30	19	25

[1] 25th. [2] 7th. [3] 5th. [4] 19th.

In addition to the above there were approximately 125 pliot-balloon observations made daily at 53 Weather Bureau stations in the United States.