

Positions and areas of sun spots—Continued

Date	Eastern standard civil time		Hellographic		Area	
			Longitude	Latitude	Spot	Group
1927						
Mar. 17 (Naval Observatory)	h. m.	°	°			
	11 57	-66.0	-10.0			31
		-54.0	-10.5			31
		-42.0	-11.0			31
		-33.5	-8.0			123
		-32.0	+34.0			586
		-22.5	+18.0	108		
		-19.0	+31.0	154		
		+1.0	-9.0	123		
		+3.5	+18.5			77
		+68.0	+16.0			93
Mar. 18 (Naval Observatory)	11 42	-52.0	-10.0			15
		-40.0	-10.5			108
		-19.5	-8.0			62
		-18.0	+34.0			432
		-10.0	+18.0	108		
		-7.5	+31.0	154		
		+14.5	-9.0	123		
		+16.0	+18.5			216
		+82.0	+15.0	62		
Mar. 19 (Naval Observatory)	11 33	-38.0	-9.5			10
		-26.0	-10.5			185
		-7.5	-9.0			46
		-5.0	+34.0			463
		+3.5	+18.0			93
		+7.5	+30.5	154		
		+28.5	-9.5			93
		+29.5	+18.5			185
Mar. 20 (Naval Observatory)	12 38	-29.5	-10.5			46
		-11.0	-10.5			154
		+2.0	+15.0	15		
		+7.0	+34.5			494
		+7.5	-9.5	31		
		+17.5	+18.0	123		
		+19.5	+30.5			216
		+42.0	-9.5	62		
		+42.5	+18.5			185
Mar. 21 (Mount Wilson)	14 45	-22.5	+8.0			16
		-15.0	+4.0	2		
		-14.0	-11.0			5
		+3.5	-11.5			91
		+18.0	-12.0			13
		+25.0	+33.0			472
		+32.5	+17.0	106		
		+53.0	-9.5			38
		+55.0	+18.0			41
Mar. 22 (Naval Observatory)	11 45	+15.0	-11.0			139
		+32.0	+35.0			370
		+33.5	-10.0	31		
		+44.0	+13.0	123		
		+44.5	+31.0	185		
		+67.5	+18.0			185
		+69.5	-9.0	31		
Mar. 23 (Naval Observatory)	13 16	-44.0	-17.0			49
		+30.0	-11.5			108
		+44.0	+35.0			216
		+58.5	+17.5	62		
		+59.0	+31.0	139		
Mar. 24 (Naval Observatory)	12 55	-65.0	+11.0	62		
		-29.0	-17.5			31
		+45.0	-11.0			46
		+68.0	+34.0			154
		+70.0	+30.5	123		
		+71.0	+17.5	108		
Mar. 25 (Naval Observatory)	11 45	-52.0	+10.5	31		
		-15.0	-17.0			15
		+10.5	-9.0			46
		+55.0	-12.0			31
		+69.5	+35.0			123
		+85.0	+17.5	154		
		+86.0	+30.5	154		
Mar. 26 (Naval Observatory)	13 58	-37.5	-41.0			31
		-37.5	+11.0	31		
		-11.5	-15.0	10		
		+24.0	-9.5			62
Mar. 27 (Naval Observatory)	13 24	-24.0	+11.0	31		
		+38.0	-9.5			62
		+44.0	+15.0			62
Mar. 28 (Naval Observatory)	14 8	No spots.	+17.5	154		
Mar. 29 (Naval Observatory)	11 43	-78.0	-7.5			62
		-80.0	+12.0	309		
Mar. 31 (Naval Observatory)	13 41	-49.5	-13.5			15
		-49.0	+17.5	108		
		-2.5	+11.0			15

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

With the exception of the lower levels at Due West and the 4,000 and 4,500 meter levels at Ellendale, all of the mean free-air temperatures for March were above normal. (See Table 1.) The largest departures occurred in the upper levels at Broken Arrow and Royal Center. As a rule the resultant winds contained an excess of

southerly component over the normal wherever the mean temperatures were above normal. (See Table 2.) Relative humidity and vapor pressures were mostly above normal, the largest departures of both elements occurring at Groesbeck.

A conspicuous feature of the resultant winds as shown by pilot-balloon observations was the pronounced north component at 2,000 meters above San Francisco and Los Angeles, whereas at some 30 other stations widely distributed over the country an equally marked west component was found at the same level. At 4,000 meters this northerly component obtained over the north Pacific coast as well, the resultants at Medford and Seattle being the same at this level as at San Francisco and Los Angeles, while at stations to the east the west component continued to predominate. An unusually large number of observations reaching very high altitudes at Medford indicated a steady increase in the north component to at least 9,000 meters where the resultant was N. 9° W. 13.5 m. p. s.

Two kite flights made at Due West on the 1st and 2d were of more than ordinary interest in that they were made during a snowfall. On the 1st this station was situated in the northeast quadrant of a low-pressure area approaching from the southwest. The kite flight showed a lapse rate of 0.47° C. per 100 meters from the ground to 900 meters above, then an inversion with a lapse rate of -0.47° C. to 1,500 meters, the maximum altitude reached. The entire air column including the inversion layer was saturated, the base of the St.-Cu. clouds being 100 meters above ground. The wind veered from east-northeast at the surface to southeast at the highest altitude. A moderate to light snowfall continued throughout the flight. Owing to the limited height reached it is, of course, not known whether the inversion continued to an even higher elevation or whether the lapse rate changed to positive and became relatively steep.

If we assume the latter, the precipitation can be explained by the overrunning of the warm saturated air within the inversion by a cold current above. Such a condition might obviously result in convection in these upper levels and in the case of saturated air produce precipitation as well. On the other hand it may be assumed that the warm air observed within the inversion had been forced up over the colder air lying nearest the ground. This forced ascent might, of course, result in sufficient cooling to produce condensation and precipitation.

By the next morning this Low's center lay just off the Carolina coast and Due West was in its west quadrant. The kite flight at this time showed practically the same temperatures and lapse rate to 900 meters above ground, the latter being 0.43° C. per 100 meters as compared to 0.47° C. on the day preceding. For the next 600 meters, however, the inversion which was found on the 1st was now replaced by colder air wherein the lapse rate was 0.45° C. Thus at 1,500 meters above ground the temperature was 6° C. lower on the 2d than on the 1st. The winds on the 2d backed from north at the surface to northwest at 1,500 meters above. Light to moderate snow fell during the ascent of this flight but before it ended the St. clouds had broken, revealing A.Cu. from the northwest and the precipitation ended.

It seems probable that the warm moisture-laden air transported from the southeast, which was observed within the inversion layer on the 1st, under-ran the cold air found above 1,500 meters on the 2d, assuming the temperature above this level had not changed appreci-

ably during the two days. The precipitation ended, however, since the source of the air changed from the low to the high pressure area.

In connection with this same depression it is found that Groesbeck on the 1st, while situated to the west of the low's center, was apparently under the influence of the approaching HIGH. A kite flight made at this station showed a lapse rate from the ground to 550 meters above, of 0.98° C. per 100 meters, above which was a strong inversion wherein the lapse rate was -0.79° C. to 1,870 meters above ground. It is not likely that this inversion would have existed had this station been under the influence of the low, since this condition is more characteristic of the front of a HIGH. While the temperatures below the base of the inversion were lower at Groesbeck than at Due West on the morning of the 1st yet within the inversion they were several degrees higher, notwithstanding the fact that the winds within the inversion were northwesterly at Groesbeck and southeasterly at Due West.

The highest kite flight ever made at the Royal Center station was obtained on the 16th when an altitude of 5,910 meters (S. L.) was reached. This record was obtained between an area of high pressure to the east and low pressure to the west.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during March, 1927—Continued

Altitude (m.) m. s. l.	RELATIVE HUMIDITY (%)										
	Broken Arrow, Okla. (233 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)		Washington, D. C. (7 m.) (mean)
	Mean	Departure from 9-yr. mean	Mean	Departure from 7-yr. mean	Mean	Departure from 10-yr. mean	Mean	Departure from 9-yr. mean	Mean	Departure from 9-yr. mean	
Surface	65	+1	73	+10	74	+1	75	+5	73	+1	64
250	65	+1	73	+10	73	-1	75	+6	73	+1	66
500	62	-1	74	+11	73	-1	75	+8	73	+2	67
750	62	0	77	+10	69	+2	74	+10	73	+4	65
1,000	63	+2	71	+9	67	+3	72	+12	68	+2	64
1,250	63	+5	69	+11	62	+3	66	+10	64	+1	61
1,500	58	+4	69	+11	56	+3	59	+7	59	-1	61
2,000	50	+3	67	+9	59	+1	42	+1	52	-1	52
2,500	45	+2	57	+5	65	+10	36	-3	46	-9	45
3,000	45	+4	43	-3	68	+12	42	+5	50	-5	40
3,500	40	+1	40	-3	61	+1	46	+10	52	-1	31
4,000	37	0			58	+5	47	+9	52	0	23
4,500	36	0			58	+6	45	+5	52	-3	
5,000					51	0			54	-3	

Altitude (m.) m. s. l.	VAPOR PRESSURE (mb.)										
	Mean	Departure from 9-yr. mean	Mean	Departure from 7-yr. mean	Mean	Departure from 10-yr. mean	Mean	Departure from 9-yr. mean			
Surface	8.34	+0.10	10.53	+0.91	4.30	+0.45	13.48	+2.07	7.05	+0.82	8.93
250	8.24	+0.07	10.40	+0.93			13.00	+2.11	6.97	+0.85	8.29
500	7.13	-0.12	9.56	+1.06	4.17	+0.43	11.91	+2.14	6.24	+0.97	7.61
750	6.57	+0.02	8.68	+0.97	3.57	+0.31	10.84	+2.00	5.76	+1.03	6.59
1,000	6.32	+0.26	7.83	+0.77	3.17	+0.22	10.10	+2.16	5.16	+0.90	6.25
1,250	5.89	+0.39	7.20	+0.74	2.80	+0.10	9.92	+1.94	4.58	+0.74	5.55
1,500	5.21	+0.32	6.71	+0.91	2.56	+0.06	7.58	+1.50	3.96	+0.48	5.09
2,000	3.78	+0.05	5.19	+0.68	2.17	+0.65	4.76	+0.38	3.16	+0.22	3.68
2,500	2.72	-0.21	3.55	+0.22	2.00	+0.23	3.49	+0.14	2.37	-0.10	2.49
3,000	2.14	-0.22	2.02	-0.27	1.64	+0.22	3.23	+0.57	2.17	+0.06	1.45
3,500	1.63	-0.23	1.56	-0.09	1.13	0.00	2.92	+0.75	1.85	+0.25	0.25
4,000	1.01	-0.38			0.74	-0.16	2.70	+0.80	1.00	+0.31	
4,500	0.63	-0.47			0.50	-0.23	2.41	+0.62	1.36	+0.28	
5,000					0.32	-0.29			1.24	+0.28	

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during March, 1927

Altitude (m.) m. s. l.	TEMPERATURE (°C.)										
	Broken Arrow, Okla. (233 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)		Washington, D. C. (7 m.) (mean)
	Mean	Departure from 9-yr. mean	Mean	Departure from 7-yr. mean	Mean	Departure from 10-yr. mean	Mean	Departure from 9-yr. mean	Mean	Departure from 9-yr. mean	
Surface	10.5	+0.5	11.3	-0.9	-0.6	+1.9	14.6	+1.4	8.0	+1.9	11.2
250	10.4	+0.5	11.3	-0.9	-0.6	+1.9	14.6	+1.4	8.0	+1.9	11.2
500	9.8	+0.2	9.9	-1.1	-1.1	+1.1	12.1	+0.9	5.6	+1.9	7.9
750	7.7	-0.6	9.4	-1.1	-1.1	+1.1	11.1	+0.9	2.6	+1.9	7.0
1,000	6.7	+0.6	6.5	-0.4	-0.4	+0.6	10.2	+0.6	1.9	+1.9	6.2
1,250	5.9	+0.4	5.6	-0.4	-0.4	+0.6	10.0	+0.8	1.3	+2.0	5.2
1,500	5.4	+0.6	5.6	-0.4	-0.4	+0.6	9.7	+1.1	0.4	+2.0	4.1
2,000	4.1	+1.0	3.6	-0.1	-0.1	+2.2	7.2	+2.1	-3.2	+1.9	0.1
2,500	2.2	+1.8	1.1	-0.3	-0.3	+1.4	4.0	+1.4	-5.3	+2.1	-2.6
3,000	1.0	+1.7	0.3	-0.3	-0.3	+1.1	1.1	+1.2	-7.6	+2.1	-3.8
3,500	1.1	+2.4	-2.9	+0.3	+0.3	-1.1	-1.1	+1.3	-10.2	+2.2	-6.0
4,000	1.4	+2.2				-17.2	-0.1				
4,500	6.7	+2.4				-20.4	-0.4				
5,000						-22.4	+0.4				

1 Naval Air Station, Anacostia, D. C.

TABLE 2.—Free-air resultant winds (m. p. s.) during March, 1927

Altitude (m.) 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)				Washington, D. C. (34 meters)				
	Mean		9-year mean		Mean		7-year mean		Mean		10-year mean		Mean		9-year mean		Mean		9-year mean		Mean		7-year mean		
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	
Surface	S. 18°W.	2.5	S. 14°W.	1.9	S. 62°E.	0.8	S. 73°W.	1.7	N. 74°W.	1.2	N. 43°W.	2.0	S. 11°W.	2.0	S. 6°E.	0.9	S. 31°W.	2.0	S. 49°W.	1.7	N. 23°W.	1.5	N. 46°W.	1.6	
250	S. 18°W.	2.5	S. 16°W.	2.0	S. 81°E.	0.9	S. 70°W.	1.8					S. 9°W.	2.6	S. 7°E.	1.6	S. 30°W.	2.1	S. 45°W.	1.8	N. 54°W.	2.2	N. 77°W.	3.2	
500	S. 25°W.	3.2	S. 19°W.	3.2	S.	1.4	S. 73°W.	3.1	N. 81°W.	1.3	N. 49°W.	2.0	S. 12°W.	4.2	S. 5°E.	3.1	S. 42°W.	3.1	S. 54°W.	4.1	N. 69°W.	3.4	N. 77°W.	5.0	
750	S. 27°W.	4.0	S. 23°W.	4.0	S. 37°W.	1.8	S. 75°W.	4.3	N. 80°W.	1.9	N. 46°W.	2.5	S. 24°W.	5.1	S. 20°E.	3.7	S. 43°W.	4.0	S. 60°W.	5.2	N. 65°W.	4.0	N. 72°W.	6.1	
1,000	S. 35°W.	4.3	S. 36°W.	4.7	S. 46°W.	3.9	S. 74°W.	5.5	S. 84°W.	3.0	N. 74°W.	4.0	S. 33°W.	6.0	S. 36°W.	4.4	S. 49°W.	4.8	S. 68°W.	6.0	N. 59°W.	4.5	N. 68°W.	6.8	
1,250	S. 53°W.	5.0	S. 49°W.	5.4	S. 45°W.	5.4	S. 74°W.	6.8	S. 80°W.	3.1	N. 74°W.	4.0	S. 40°W.	6.8	S. 46°W.	5.0	S. 61°W.	5.4	S. 74°W.	7.1	N. 62°W.	5.5	N. 66°W.	8.3	
1,500	S. 53°W.	6.4	S. 63°W.	5.9	S. 49°W.	7.1	S. 76°W.	8.5	S. 81°W.	3.3	N. 75°W.	6.1	S. 39°W.	7.5	S. 50°W.	5.3	S. 62°W.	6.8	S. 31°W.	9.4	N. 82°W.	7.8	N. 69°W.	8.9	
2,000	S. 62°W.	7.8	S. 73°W.	7.0	S. 58°W.	8.9	S. 80°W.	10.8	S. 85°W.	4.4	N. 74°W.	5.9	S. 50°W.	7.7	S. 62°W.	6.5	S. 76°W.	7.8	S. 85°W.	10.5	N. 48°W.	7.2	N. 66°W.	9.3	
2,500	S. 75°W.	8.2	S. 88°W.	8.3	S. 67°W.	9.5	S. 87°W.	12.1	S. 77°W.	6.5	N. 75°W.	9.1	S. 47°W.	8.6	S. 76°W.	8.6	S. 72°W.	11.9	S.	13.2	N. 54°W.	9.2	N. 72°W.	11.1	
3,000	S. 68°W.	10.1	N. 89°W.	9.7	S. 67°W.	13.8	S. 83°W.	14.3	N. 87°W.	9.7	N. 75°W.	11.1	S. 72°W.	10.9	S. 74°W.	12.0	S. 88°W.	15.1	N. 72°W.	10.6	N. 81°W.	12.6	N. 81°W.	12.6	
3,500	S. 68°W.	10.3	S. 82°W.	10.6	S. 67°W.	18.3	S. 85°W.	14.9	S. 81°W.	12.3	N. 81°W.	12.8	S. 72°W.	14.0	S. 63°W.	12.2	S. 69°W.	14.1	S. 66°W.	9.8	S. 83°W.	13.4	N. 53°W.	11.4	
4,000	S. 77°W.	13.7	S. 78°W.	11.4	S. 22°W.	12.0	S. 88°W.	15.7	S. 68°W.	15.0	N. 86°W.	14.4	S. 84°W.	11.8	S. 83°W.	13.1	S. 79°W.	9.4	S. 85°W.	11.2		N. 72°W.	13.5	N. 72°W.	13.5
4,500	S. 82°W.	16.2	S. 69°W.	13.4						17.0	N. 87°W.	14.4	S. 84°W.	11.8	S. 83°W.	13.1	S. 79°W.	9.4	S. 85°W.	11.2		N. 72°W.	13.5	N. 72°W.	13.5
5,000		21.0	S. 70°W.	8.8							21.0	N. 84°W.	16.0									N. 75°W.	13.4		