

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longi-tude	Lati-tude	Spot	Group	
1929—Continued							
Jan. 26 (Naval Observa-tory).	12 00	° -2.0 +26.0 +65.0	° 298.5 328.5 5.5	° +8.0 +5.5 -11.0	170 31 340		541
Jan. 27 (Harvard)	13 10	+13.5 +28.0 +81.5	299.5 314.0 7.5	+8.0 +12.0 -10.0	17 710	124	851
Jan. 28 (Naval Observa-tory).	12 12	+22.5 +26.0 +49.0	296.6 300.1 323.1	-22.0 +7.5 +6.5	12 185 15		212
Jan. 29 (Naval Observa-tory).	11 53	+40.0 +61.5	301.1 322.6	+7.5 +6.0	15	77	92
Jan. 30 (Naval Observa-tory).	12 1	-7.5 +54.5	240.4 302.4	-4.5 +8.0	77	123	200
Jan. 31 (Naval Observa-tory).	11 15	-71.0 +6.0 +67.0	164.1 241.1 302.1	+5.0 -5.0 +8.5	77 154		293
Mean daily area for January.							756

PROVISIONAL SUN-SPOT RELATIVE NUMBERS<sup>1</sup> FOR JANUARY, 1929

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

January, 1929	Relative numbers	January, 1929	Relative numbers	January, 1929	Relative numbers
1		11	44	21	77
2		12	<sup>3</sup> M 82	22	65
3	64	13	<sup>4</sup> 82	23	102
4	66	14	<sup>4</sup> 90	24	( <sup>4</sup> )
5	45	15	77	25	51 ?
6	<sup>3</sup> E 39	16	113	26	( <sup>2</sup> )
7	61	17	( <sup>2</sup> )	27	55
8	<sup>4</sup> 73	18	89	28	20
9	80	19	77	29	22
10	<sup>4</sup> 74	20	92	30	<sup>3</sup> M 29
				31	<sup>4</sup> 31

Mean, 26 days, 65.4.

- <sup>1</sup> Dependent alone on observations at Zurich University and its station at Arosa.
- <sup>2</sup> Passage of a large group through the central meridian.
- <sup>3</sup> New formation of a larger or average-sized center of activity; E, on the eastern part of the sun's disk; M, near the central meridian.
- <sup>4</sup> Passage of an average-sized group through the central meridian.

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

Free-air temperatures for the month averaged below normal except at the eastern stations, Due West and Washington. (Table 1.) The negative departures were greatest at Ellendale where they were excessive but were successively smaller at the stations farther south.

Free-air relative humidities averaged above normal in many cases and particularly in the upper levels at Royal Center where the departures were unusually large. At this station and at Ellendale where negative temperature departures were greatest the total precipitation for the month exceeded all previous amounts for January. In this connection it is noted that the average vapor pressures in the higher levels at Royal Center were appreciably above normal notwithstanding the fact that the mean temperatures at the same levels were considerably below normal.

Table 2 shows the monthly resultant wind velocities to have been close to normal and the directions having in general a more northerly or less southerly component than normal.

It is interesting to note the Groesbeck kite record of the 27th in connection with the dissipation of a solid layer of stratus clouds over that station at 5:40 a. m. The balloon observation at that time showed the height of their base to be 500 meters and the wind at this elevation from the southwest. By 7:20 a. m. these clouds had dissipated and the kite observations showed the wind at 500 meters to be from the west although the surface wind continued from the southwest. This station was at the time in front of a wind shift line and it is evident that with the change in wind direction at the 500-meter level, dry air from a totally different source arrived and resulted in the dissipation of the clouds. The shift to northerly at the surface, however, did not occur until several hours later.

An interesting condition of snow flurries in a high-pressure area occurred at Royal Center on the 15th. The kite flight made during the occurrence of this precipitation revealed an inverted lapse rate from the ground to the cloud level at 500 meters, practically isothermal from the base to the top of the clouds at 850 meters, superimposed by another inversion layer to 1,850 meters. The occurrence of light snow flurries falling from air actually warmer than the air below it, is a result of the neighboring Great Lakes. These flurries form over the relatively warm water and later extend some distance beyond over the land which is considerably colder than the water.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during January, 1929

Altitude m. s. l.	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	De-parture from normal	Mean	De-parture from normal	Mean	De-parture from normal	Mean	De-parture from normal	Mean	De-parture from normal	Mean	De-parture from normal
Surface	0.0	-3.2	4.8	-0.9	-17.7	-6.6	8.4	+0.4	-8.5	-4.2	-1.6	-0.8
250	-0.1	-3.2	4.8	-0.8			8.0	+0.2	-8.6	-4.1	-1.8	-0.8
500	-1.0	-3.7	5.3	-0.1	-17.9	-6.9	7.2	-0.3	-9.9	-4.4	-2.3	-1.0
750	-1.1	-3.6	5.8	+0.7	-17.6	-7.8	6.8	-0.7	-10.3	-4.7	-2.7	-1.0
1,000	-0.1	-2.7	5.4	+0.9	-16.6	-7.4	6.5	-0.8	-9.6	-4.1	-3.5	-1.1
1,250	0.4	-2.2	4.7	+0.9	-15.9	-7.9	6.6	-0.4	-9.6	-4.0	-4.2	-1.1
1,500	0.3	-2.0	3.7	+0.8	-15.8	-7.7	6.0	-0.4	-9.8	-3.8	-4.3	-0.8
2,000	-0.6	-1.5	1.4	+0.4	-16.4	-6.8	4.7	0.0	-10.6	-3.6	-4.5	0.0
2,500	-2.6	-1.3	-0.9	+0.1	-17.8	-6.0	2.6	0.0	-11.9	-3.0	-5.5	+0.6
3,000	-4.9	-1.1	-2.9	+0.3	-19.9	-5.5	0.4	+0.1	-14.3	-3.1	-6.8	+1.1
3,500	-7.5	-1.1	-5.1	+0.3	-21.4	-4.2	-2.8	-0.3	-16.8	-3.1	-8.4	+1.4
4,000	-10.8	-1.5	-8.4	-0.1	-24.0	-4.2	-5.6	-0.3	-18.9	-3.6	-10.2	+1.4
4,500			-12.3	-1.1					-21.2	-3.4	-11.9	+1.4

Surface	RELATIVE HUMIDITY (%)											
	73	+3	73	+5	78	-3	75	-2	78	-3	66	-1
250	73	+3	72	+5			72	-3	78	-3	62	-2
500	71	+7	63	+2	77	-2	69	-2	75	0	59	-2
750	69	+9	57	-1	76	+4	67	0	70	0	57	-2
1,000	63	+8	55	-1	73	+7	60	-2	68	+1	56	-3
1,250	55	+5	54	0	71	+10	56	-1	65	+4	55	-3
1,500	49	+3	56	+4	71	+12	55	+1	67	+9	51	-5
2,000	44	-3	58	+9	67	+9	49	0	60	+7	47	-7
2,500	42	+2	57	+12	58	0	47	+1	66	+12	48	-5
3,000	40	0	58	+16	58	0	40	-2	74	+19	46	-7
3,500	42	+1	55	+16	50	-6	39	-1	79	+22	55	+1
4,000	44	+2	56	+15	45	-9	40	+2	79	+23	63	+1
4,500			57	+16					78	+23	73	+1

Surface	VAPOR PRESSURE (mb.)											
	4.67	-1.01	6.78	+0.03	1.26	-1.14	8.88	+0.02	2.57	-1.24	3.83	-0.33
250	4.63 <td>-1.01</td> <td>6.68 <td>+0.01</td> <td></td> <td></td> <td>8.38 <td>-0.12</td> <td>2.54 <td>-1.19</td> <td>3.56 <td>-0.39</td> </td></td></td></td>	-1.01	6.68 <td>+0.01</td> <td></td> <td></td> <td>8.38 <td>-0.12</td> <td>2.54 <td>-1.19</td> <td>3.56 <td>-0.39</td> </td></td></td>	+0.01			8.38 <td>-0.12</td> <td>2.54 <td>-1.19</td> <td>3.56 <td>-0.39</td> </td></td>	-0.12	2.54 <td>-1.19</td> <td>3.56 <td>-0.39</td> </td>	-1.19	3.56 <td>-0.39</td>	-0.39
500	4.30 <td>-0.76</td> <td>6.09 <td>-0.03</td> <td>1.23 <td>-1.12</td> <td>7.54 <td>-0.26</td> <td>2.26 <td>-1.05</td> <td>3.26 <td>-0.45</td> </td></td></td></td></td>	-0.76	6.09 <td>-0.03</td> <td>1.23 <td>-1.12</td> <td>7.54 <td>-0.26</td> <td>2.26 <td>-1.05</td> <td>3.26 <td>-0.45</td> </td></td></td></td>	-0.03	1.23 <td>-1.12</td> <td>7.54 <td>-0.26</td> <td>2.26 <td>-1.05</td> <td>3.26 <td>-0.45</td> </td></td></td>	-1.12	7.54 <td>-0.26</td> <td>2.26 <td>-1.05</td> <td>3.26 <td>-0.45</td> </td></td>	-0.26	2.26 <td>-1.05</td> <td>3.26 <td>-0.45</td> </td>	-1.05	3.26 <td>-0.45</td>	-0.45
750	4.09 <td>-0.51</td> <td>5.72 <td>-0.03</td> <td>1.25 <td>-0.95</td> <td>7.04 <td>-0.17</td> <td>2.06 <td>-0.97</td> <td>3.08 <td>-0.45</td> </td></td></td></td></td>	-0.51	5.72 <td>-0.03</td> <td>1.25 <td>-0.95</td> <td>7.04 <td>-0.17</td> <td>2.06 <td>-0.97</td> <td>3.08 <td>-0.45</td> </td></td></td></td>	-0.03	1.25 <td>-0.95</td> <td>7.04 <td>-0.17</td> <td>2.06 <td>-0.97</td> <td>3.08 <td>-0.45</td> </td></td></td>	-0.95	7.04 <td>-0.17</td> <td>2.06 <td>-0.97</td> <td>3.08 <td>-0.45</td> </td></td>	-0.17	2.06 <td>-0.97</td> <td>3.08 <td>-0.45</td> </td>	-0.97	3.08 <td>-0.45</td>	-0.45
1,000	4.00 <td>-0.20</td> <td>5.36 <td>-0.01</td> <td>1.31 <td>-0.84</td> <td>6.22 <td>-0.28</td> <td>2.03 <td>-0.76</td> <td>2.84 <td>-0.45</td> </td></td></td></td></td>	-0.20	5.36 <td>-0.01</td> <td>1.31 <td>-0.84</td> <td>6.22 <td>-0.28</td> <td>2.03 <td>-0.76</td> <td>2.84 <td>-0.45</td> </td></td></td></td>	-0.01	1.31 <td>-0.84</td> <td>6.22 <td>-0.28</td> <td>2.03 <td>-0.76</td> <td>2.84 <td>-0.45</td> </td></td></td>	-0.84	6.22 <td>-0.28</td> <td>2.03 <td>-0.76</td> <td>2.84 <td>-0.45</td> </td></td>	-0.28	2.03 <td>-0.76</td> <td>2.84 <td>-0.45</td> </td>	-0.76	2.84 <td>-0.45</td>	-0.45
1,250	3.57 <td>-0.21</td> <td>4.90 <td>0.00</td> <td>1.35 <td>-0.74</td> <td>5.75 <td>-0.08</td> <td>2.02 <td>-0.53</td> <td>2.62 <td>-0.44</td> </td></td></td></td></td>	-0.21	4.90 <td>0.00</td> <td>1.35 <td>-0.74</td> <td>5.75 <td>-0.08</td> <td>2.02 <td>-0.53</td> <td>2.62 <td>-0.44</td> </td></td></td></td>	0.00	1.35 <td>-0.74</td> <td>5.75 <td>-0.08</td> <td>2.02 <td>-0.53</td> <td>2.62 <td>-0.44</td> </td></td></td>	-0.74	5.75 <td>-0.08</td> <td>2.02 <td>-0.53</td> <td>2.62 <td>-0.44</td> </td></td>	-0.08	2.02 <td>-0.53</td> <td>2.62 <td>-0.44</td> </td>	-0.53	2.62 <td>-0.44</td>	-0.44
1,500	3.12 <td>-0.25</td> <td>4.78 <td>+0.36</td> <td>1.36 <td>-0.61</td> <td>5.43 <td>+0.20</td> <td>2.01 <td>-0.32</td> <td>2.38 <td>-0.47</td> </td></td></td></td></td>	-0.25	4.78 <td>+0.36</td> <td>1.36 <td>-0.61</td> <td>5.43 <td>+0.20</td> <td>2.01 <td>-0.32</td> <td>2.38 <td>-0.47</td> </td></td></td></td>	+0.36	1.36 <td>-0.61</td> <td>5.43 <td>+0.20</td> <td>2.01 <td>-0.32</td> <td>2.38 <td>-0.47</td> </td></td></td>	-0.61	5.43 <td>+0.20</td> <td>2.01 <td>-0.32</td> <td>2.38 <td>-0.47</td> </td></td>	+0.20	2.01 <td>-0.32</td> <td>2.38 <td>-0.47</td> </td>	-0.32	2.38 <td>-0.47</td>	-0.47
2,000	2.53 <td>-0.21</td> <td>4.23 <td>+0.61</td> <td>1.24 <td>-0.46</td> <td>4.58 <td>+0.40</td> <td>1.71 <td>-0.21</td> <td>2.06 <td>-0.38</td> </td></td></td></td></td>	-0.21	4.23 <td>+0.61</td> <td>1.24 <td>-0.46</td> <td>4.58 <td>+0.40</td> <td>1.71 <td>-0.21</td> <td>2.06 <td>-0.38</td> </td></td></td></td>	+0.61	1.24 <td>-0.46</td> <td>4.58 <td>+0.40</td> <td>1.71 <td>-0.21</td> <td>2.06 <td>-0.38</td> </td></td></td>	-0.46	4.58 <td>+0.40</td> <td>1.71 <td>-0.21</td> <td>2.06 <td>-0.38</td> </td></td>	+0.40	1.71 <td>-0.21</td> <td>2.06 <td>-0.38</td> </td>	-0.21	2.06 <td>-0.38</td>	-0.38
2,500	2.04 <td>-0.26</td> <td>3.52 <td>-0.74</td> <td>0.98 <td>-0.41</td> <td>3.91 <td>+0.54</td> <td>1.80 <td>+0.15</td> <td>1.94 <td>-0.16</td> </td></td></td></td></td>	-0.26	3.52 <td>-0.74</td> <td>0.98 <td>-0.41</td> <td>3.91 <td>+0.54</td> <td>1.80 <td>+0.15</td> <td>1.94 <td>-0.16</td> </td></td></td></td>	-0.74	0.98 <td>-0.41</td> <td>3.91 <td>+0.54</td> <td>1.80 <td>+0.15</td> <td>1.94 <td>-0.16</td> </td></td></td>	-0.41	3.91 <td>+0.54</td> <td>1.80 <td>+0.15</td> <td>1.94 <td>-0.16</td> </td></td>	+0.54	1.80 <td>+0.15</td> <td>1.94 <td>-0.16</td> </td>	+0.15	1.94 <td>-0.16</td>	-0.16
3,000	1.65 <td>-0.30</td> <td>3.30</td> <td>+1.11</td> <td>0.84 <td>-0.24</td> <td>3.06 <td>+0.40</td> <td>1.70 <td>+0.26</td> <td>1.64 <td>-0.15</td> </td></td></td></td>	-0.30	3.30	+1.11	0.84 <td>-0.24</td> <td>3.06 <td>+0.40</td> <td>1.70 <td>+0.26</td> <td>1.64 <td>-0.15</td> </td></td></td>	-0.24	3.06 <td>+0.40</td> <td>1.70 <td>+0.26</td> <td>1.64 <td>-0.15</td> </td></td>	+0.40	1.70 <td>+0.26</td> <td>1.64 <td>-0.15</td> </td>	+0.26	1.64 <td>-0.15</td>	-0.15
3,500	1.56 <td>-0.12</td> <td>3.00</td> <td>+1.33</td> <td>0.69 <td>-0.09</td> <td>2.77 <td>+0.65</td> <td>1.66 <td>+0.39</td> <td>1.72 <td>+0.11</td> </td></td></td></td>	-0.12	3.00	+1.33	0.69 <td>-0.09</td> <td>2.77 <td>+0.65</td> <td>1.66 <td>+0.39</td> <td>1.72 <td>+0.11</td> </td></td></td>	-0.09	2.77 <td>+0.65</td> <td>1.66 <td>+0.39</td> <td>1.72 <td>+0.11</td> </td></td>	+0.65	1.66 <td>+0.39</td> <td>1.72 <td>+0.11</td> </td>	+0.39	1.72 <td>+0.11</td>	+0.11
4,000	1.45 <td>+0.04</td> <td>2.54</td> <td>+1.12</td> <td>0.64 <td>+0.07</td> <td>2.65 <td>+0.91</td> <td>1.60 <td>+0.59</td> <td>1.60 <td>+0.11</td> </td></td></td></td>	+0.04	2.54	+1.12	0.64 <td>+0.07</td> <td>2.65 <td>+0.91</td> <td>1.60 <td>+0.59</td> <td>1.60 <td>+0.11</td> </td></td></td>	+0.07	2.65 <td>+0.91</td> <td>1.60 <td>+0.59</td> <td>1.60 <td>+0.11</td> </td></td>	+0.91	1.60 <td>+0.59</td> <td>1.60 <td>+0.11</td> </td>	+0.59	1.60 <td>+0.11</td>	+0.11
4,500			2.09 <td>+0.93</td> <td></td> <td></td> <td></td> <td></td> <td>1.54 <td>+0.71</td> <td>1.55 <td>+0.11</td> </td></td>	+0.93					1.54 <td>+0.71</td> <td>1.55 <td>+0.11</td> </td>	+0.71	1.55 <td>+0.11</td>	+0.11

<sup>1</sup> Naval Air Station.