TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Pittsburgh	Fairbanks	Twin Falls	La Jolla	Gainesville	Miami	New Orleans
	Gram calories per square centimeter												
1933	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*	*Cal.*
Jan. 29	236	143	246	124	183	245	115	14	222	254	124	349	149
Feb. 5	294	246	299	222	205	362	178	31	249	268	130	320	188
Feb. 12	232	255	335	198	218	284	201	68	311	315	195	382	228
Feb. 19	308	262	380	269	231	417	226	123	270	309	264	372	232
	Departures from weekly normals												
Jan. 29	+37	−44	+18	+6	+45	+14	−5	.....	+27	±0	−125	−3	.....
Feb. 5	+92	+38	+36	+90	+57	+94	+27	.....	+19	+14	−143	−43	.....
Feb. 12	+6	+26	+50	+46	+52	−28	+24	.....	+41	+36	−115	+11	.....
Feb. 19	+49	+10	+71	+89	+35	+63	+85	.....	−12	−12	−79	±0	.....
	Accumulated departures on Feb. 26												
	+1,736	−420	+1,281	+2,331	+2,142	+294	+1,120	.....	−98	−399	−5,523	−840	.....

TABLE 3.—*Solar radiation measurements, and determinations of atmospheric-turbidity factor, β, Washington, D.C., February 1933*

[Values in italics have been interpolated]

Date and solar hour angle	Solar altitude, *h.*	Air mass, *m.*	I_m	I_y	I_r	β	Blueness of sky	Atmospheric dust particles per cubic centimeter	Notes: Skylight polarization, P., clouds, etc.
Feb. 2			*gr. cal.*	*gr. cal.*	*gr. cal.*				
0:18 a	34-11	1.78	1.248	*0.936*	0.755	0.065		699	
0:13 a	34-09	1.78	1.244	.936	*.755*	.068			
1:24 p	30-56	1.94	1.148	.826	.661	.055			
1:30 p	30-22	1.96	1.155	*.818*	.655	.050	5		P=53.7.
3:34 p	15-08	3.79	.768	.570	*.424*	.040			
Feb. 3									
3:33 a	15-33	3.70	.879	*.756*	.641	.085		586	
3:25 a	16-48	3.43	.948	.764	*.644*	.065			
3:20 a	17-33	3.34	.954	*.770*	.647	.065			
3:08 a	19-18	3.03	.976	.779	*.656*	.070			
Feb. 8									
1:47 a	30-27	1.96	1.309	*958*	.749	.020	5	479	P=55.2.
1:42 a	31-36	1.90	1.306	.943	*.743*	.020			
0:49 a	34-52	1.75	1.233	*.925*	.718	.020			
0:44 a	35-09	1.70	1.301	.921	*.714*	.023			
Feb. 9									
1:15 a	33-37	1.80	1.416	1.058	*.850*	.030		420	
1:11 a	33-58	1.79	1.431	*1.058*	.850	.025			
0:31 a	35-58	1.70	1.448	1.060	*.861*	.030			
0:26 a	36-06	1.69	1.459	*1.058*	.862	.025			
1:39 p	31-26	1.92	1.331	.982	*.797*	.035	6		P=56.3.
1:42 p	31-22	1.92	1.333	*.979*	.797	.035			
2:53 p	23-12	2.53	1.249	*.905*	.727	.020			
2:59 p	22-07	2.65	1.236	.900	*.721*	.020			
3:27 p	17-54	3.24	1.143	.844	*.692*	.020			
3:33 p	17-45	3.26	1.129	*.838*	.688	.020			
3:43 p	15-23	3.74	1.049	*.785*	.673	.030			
3:47 p	14-45	3.89	1.024	.779	*.668*	.030			
Feb. 16									
3:46 a	16-16	3.54	1.102	*.761*	.745	.040		284	
3:42 a	17-16	3.34	1.108	.858	*.749*	.045			
3:28 a	19-30	2.98	1.160	.904	*.753*	.040			
3:23 a	20-18	2.86	1.204	*.906*	.754	.035			
2:48 a	25-32	2.31	1.294	*.970*	.797	.030			
2:43 a	26-14	2.26	1.304	.970	.795	.030	4		P=50.2.
1:17 a	35-40	1.71	1.378	*.974*	.788	.025			
1:13 a	36-00	1.70	1.371	.974	*.785*	.025			
1:09 a	36-18	1.69	1.388	*.971*	.764	.020			
1:00 p	38-40	1.60	1.473	*1.018*	.842	.020			
1:03 p	38-30	1.61	1.475	1.011	*.841*	.020			
1:24 p	36-52	1.67	1.440	*.993*	.792	.020			
1:28 p	36-32	1.68	1.440	.991	*.791*	.020			
1:47 p	34-45	1.74	1.414	*.983*	.782	.020			
1:50 p	34-24	1.76	1.402	.982	*.779*	.020			
Feb. 24									
3:39 a	19-46	2.94	.779	*.620*	.512	.100		420	
3:36 a	20-22	2.86	.795	.617	*.514*	.095			
3:08 a	24-51	2.37	.888	.671	*.547*	.090			
3:03 a	25-34	2.31	.091	*.668*	.549	.085	4		P=49.2.
1:05 a	39-20	1.58	1.056	*.752*	.567	.070			
1:01 a	39-36	1.57	1.066	.733	*.568*	.065			

TABLE 3.—*Solar radiation measurements, and determinations of atmospheric-turbidity factor, β, Washington, D.C., February 1933*—Continued.

Date and solar hour angle	Solar altitude, *h.*	Air mass, *m.*	I_m	I_y	I_r	β	Blueness of sky	Atmospheric dust particles per cubic centimeter	Notes: Skylight polarization, P., clouds, etc.
Feb. 28									
4:29 a	12-30	4.54	1.041	0.849	*0.715*	0.030		254	
4:24 a	13-24	4.33	1.086	*.852*	.718	.025			
4:18 a	14-29	3.94	1.133	.900	*.756*	.020			
4:13 a	15-23	3.73	1.161	*.903*	.739	.020			
3:55 a	21-44	2.69	1.262	*.952*	.749	.020			
3:30 a	22-44	2.58	1.277	.955	*.752*	.020			
2:17 a	33-40	1.80	1.401	1.003	*.806*	.020	5		P=50.2.
2:12 a	34-19	1.78	1.398	*1.003*	.809	.020			
0:47 a	43-02	1.46	1.466	*1.054*	.826	.020			
0:43 a	42-14	1.49	1.467	1.034	*.826*	.020			

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, Superintendent United States Naval Observatory. Data furnished by Naval Observatory, in cooperation with Harvard, Perkins, and Mount Wilson Observatories. The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column]

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1933	*h. m.*	°	°	°			
Feb. 2 (Naval Observatory)	11 20	−62.0	303.3	+13.0	.....	1173	.....
		−45.0	320.3	+10.0	.....	46	.....
		−36.0	329.3	+10.0	77	.....	.....
		+15.0	20.3	+6.0	.....	216	1,512
Feb. 3 (Naval Observatory)	14 31	−48.0	302.4	+13.0	.....	1111	.....
		−21.0	329.4	+10.0	77	.....	.....
		+30.0	20.4	+6.0	.....	185	1,373
Feb. 4 (Mount Wilson)	12 30	−35.0	303.3	+13.0	.....	1091	.....
		−8.0	330.3	+11.0	80	.....	.....
		+48.0	26.3	+8.0	114	.....	1,285
Feb. 5 (Naval Observatory)	12 53	−22.0	303.0	+13.0	.....	1173	.....
		+4.0	329.0	+10.0	77	.....	.....
		+62.0	27.0	+6.0	123	.....	1,373
Feb. 6 (Naval Observatory)	10 55	−9.0	303.9	+13.0	.....	957	.....
		+16.0	328.9	+10.0	62	.....	.....
		+74.0	26.9	+6.0	154	.....	1,173
Feb. 7 (Naval Observatory)	10 20	+2.0	302.0	+13.0	.....	1049	.....
		+29.0	329.0	+10.0	77	.....	.....
		+70.0	10.0	−12.0	.....	46	1,172
Feb. 8 (Naval Observatory)	10 43	+16.0	302.6	+13.0	.....	710	.....
		+43.0	329.6	+9.0	62	.....	772
Feb. 9 (Naval Observatory)	10 32	+29.0	302.6	+13.0	.....	741	.....
		+56.0	329.6	+9.0	93	.....	834

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	
1933	h. m.	°	°	°			
Feb. 10 (Naval Observatory)	11 18	+41.0	301.0	+13.0		710	
		+69.0	329.0	+9.0	62		772
Feb. 11 (Naval Observatory)	11 0	+56.0	303.0	+13.0		679	679
Feb. 12 (Naval Observatory)	12 14	+70.0	303.1	+13.0		556	556
Feb. 13 (Perkins Observatory)	12 30	+86.0	305.8	+5.0		125	125
Feb. 14 (Mount Wilson)	14 10	−57.0	148.7	+1.0		4	4
Feb. 15 (Mount Wilson)	17 35	−41.0	149.7	+1.0		3	3
Feb. 16 (Naval Observatory)	11 29	No spots.					
Feb. 17 (Mount Wilson)	12 30	No spots.					
Feb. 18 (Naval Observatory)	12 22	No spots.					
Feb. 19 (Naval Observatory)	11 24	No spots.					
Feb. 20 (Perkins Observatory)	12 30	No spots.					
Feb. 21 (Naval Observatory)	10 51	No spots.					
Feb. 22 (Naval Observatory)	11 10	No spots.					
Feb. 23 (Naval Observatory)	11 18	No spots.					
Feb. 24 (Naval Observatory)	11 15	No spots.					
Feb. 25 (Perkins Observatory)	15 35	No spots.					
Feb. 26 (Naval Observatory)	13 4	No spots.					
Feb. 27 (Naval Observatory)	11 40	−63.0	332.9	+7.0	31		31
Feb. 28 (Naval Observatory)	11 29	−72.0	310.8	+16.0	123		123
Mean daily area for February							437

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR FEBRUARY, 1933

[Dependent alone on observations at Zurich and its station at Arosa]
[Data furnished through the courtesy of Prof. W. Brunner, University of Zurich, Switzerland]

February 1933	Relative numbers	February 1933	Relative numbers	February 1933	Relative numbers
1	*ad* 45	11		21	0
2		12	16	22	0
3	67	13	11	23	0
4		14	8	24	0
5	*a* 62	15	0	25	0
6	*b* 69	16	0	26	0
7	*b* 80	17	0	27	8
8	53	18	0	28	*d* 14
9	46	19	0		
10	32	20	0		

Mean: 25 days=20.4.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group or spot through the central meridian.
c=New formation of a 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

[Aerological Division, W. R. Gregg, in charge]

By L. T. SAMUELS

Free-air temperatures during February were considerably below normal at the northern stations with the largest departures occurring at Ellendale. Temperatures at the southern stations averaged above normal with the largest departures at Atlanta. Table 1 shows that, contrary to the usual inverse relationship between the monthly temperature and relative humidity departures, this relationship was direct at most stations. Under such conditions there often is found a correlation between the monthly precipitation and relative humidity departures. Such a relationship was strikingly apparent at those stations having temperature and relative humidity departures of the same sign, e.g., Chicago, −0.92 in.; Atlanta, +0.87 in.; Omaha, −0.64 in.; Cleveland, −0.52 in.; and Dallas, +0.34 in.

As would be expected from the fact that the normal latitudinal temperature gradient was intensified by the super-normal temperatures over the south and subnormal temperatures over the north, the resultant wind velocities for the month were considerably above normal. Resultant free-air wind directions were close to normal over most of the country. The greatest deviations occurred over the north Pacific States where the normal southwesterly component was replaced by one from the northwest.

TABLE 1.—*Free-air temperatures and relative humidities during February 1933*

TEMPERATURE (°C.)

Altitude (meters) m.s.l.	Atlanta, Ga. (303 meters) [1]		Boston, Mass. (6 meters) [2]		Chicago, Ill. (187 meters) [3]		Cleveland, Ohio (246 meters) [3]		Dallas, Tex. (146 meters) [4]		Ellendale, N.Dak. (444 meters)		Omaha, Nebr. (300 meters) [5]		San Diego, Calif. (9 meters) [6]		Washington, D.C. (2 meters) [6]	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	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	5.4	(7)	−0.6		−6.5	(7)	−3.4	(7)	4.2	(7)	−12.1	−2.4	−6.0	(7)	10.1	−2.5	.0	−1.7
500	5.9	(7)	−4.0		−6.2	(7)	−4.1	(7)	5.3	(7)	−12.3	−2.6	−6.1	(7)	10.5	−1.3	.3	−.7
1,000	5.9	0	−5.4		−6.8	−3.0	−6.4	−2.6	5.6	−1.6	−11.5	−2.9	−4.1	−0.7	8.8	−1.4	−.4	+.2
1,500	5.8	+1.8	−7.1		−8.0	−3.2	−7.6	−2.8	5.2	−.7	−12.4	−4.3	−4.4	−1.4				
2,000	4.5	+2.4	−8.9		−9.3	−3.0	−8.8	−2.5	4.7	+.7	−14.1	−4.6	−6.4	−2.1	4.3	−1.1	−2.9	+.6
2,500	2.7	+3.0	−11.0		−11.6	−3.4	−10.8	−2.6	2.3	+.7	−16.9	−5.1	−8.7	−2.2				
3,000	.6	+3.4	−13.3		−14.4	−3.8	−13.4	−2.8	−.1	+.8	−19.3	−4.8	−11.4	−2.3	−.7	−1.3	−6.8	+.8
4,000	−5.4	+3.2	−19.0		−19.3	−2.8	−19.1	−2.6	−5.5	+.3			−17.6	−2.9			−11.2	+2.8
5,000	−12.1	+2.1	−26.3		−25.7	−2.7	−26.2	−3.2	−12.4	−.9			−23.9	−2.4				

RELATIVE HUMIDITY (PERCENT)

Surface	83	(7)	68		78	(7)	75	(7)	82	(7)	76	−5	72	(7)	67	−1	71	0
500	82	(7)	66		72	(7)	73	(7)	74	(7)	75	−5	66	(7)	59	−3	62	−1
1,000	80	+20	64		64	−7	70	−1	61	+2	68	−2	54	−10	51	−4	56	−4
1,500	70	+14	61		59	−3	62	0	54	+2	65	+3	49	−8				
2,000	64	+11	59		52	−5	55	−2	47	0	64	+5	45	−8	40	−3	52	−1
2,500	62	+11	57		48	−8	50	−6	46	+2	65	+6	41	−11				
3,000	58	+9	54		47	−10	52	−5	45	+3	60	+2	41	−11	30	−1	52	+2
4,000	54	+8	51		47	−10	50	−7	41	+5			45	−5			54	+3
5,000	49	+3	49		47	−11	55	−3	40	+8			41	−9				

Weather Bureau airplane observations made near 5 a.m.; Navy airplane observations near 7 a.m.; Ellendale kite observations near 9 a.m. (seventy-fifth meridian time).

[1] Temperature and humidity departures based on normals of Due West, S.C.
[2] Airplane observations made by Massachusetts Institute of Technology.
[3] Temperature and humidity departures based on normals of Royal Center, Ind.
[4] Temperature departures based on normals determined by interpolating between those of Groesbeck, Tex., and Broken Arrow, Okla. Humidity departures based on normals of Groesbeck, Tex.
[5] Temperature and humidity departures based on normals of Drexel, Nebr.
[6] Naval air stations.
[7] Surface and 500-meter departures omitted because of difference in time of day between airplane observations and those of kites upon which the normals are based.