TABLE 3.—*Solar radiation measurements, and determinations of atmospheric turbidity factor, β, Washington, D.C., May 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.
May 18			*gr. cal.*	*gr. cal.*	*gr. cal.*				
5:43a	15–29	3.70	0.776	0.593	*0.510*	0.090		727	
5:39a	16–05	3.58	.812	*.596*	.514	.080			
5:26a	18–34	3.12	.888	*.664*	.539	.070			
5:20a	19–44	2.95	.914	.667	*.543*	.068			
5:01a	23–26	2.51	.990	.706	*.570*	.070			
4:57 a	24–12	2.43	.997	*.711*	.573	.072			
3:51 a	37–04	1.65	1.141	*.818*	.648	.105	5		P=56.4%
3:44 a	38–22	1.61	1.139	.818	*.651*	.115			

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.*	°	°	°			
May 1 (Naval Observatory)	11	0	No spots			------	------	------
May 2 (Naval Observatory)	10	38	No spots			------	------	------
May 3 (Mount Wilson)	9	30	No spots			------	------	------
May 5 (Naval Observatory)	10	29	No spots			------	------	------
May 6 (Mount Wilson)	9	30	No spots			------	------	------
May 7 (Naval Observatory)	13	29	No spots			------	------	------
May 9 (Mount Wilson)	9	17	−22.0	158.4	−6.0	------	6	6
May 12 (Mount Wilson)	11	5	+8.0	147.6	−13.0	------	4	4
May 13 (Naval Observatory)	13	8	No spots			------	------	------
May 14 (Naval Observatory)	11	11	No spots			------	------	------
May 15 (Mount Wilson)	13	0	No spots			------	------	------
May 16 (Naval Observatory)	14	7	No spots			------	------	------
May 17 (Naval Observatory)	14	39	No spots			------	------	------
May 18 (Naval Observatory)	11	34	+12.0	72.0	+7.0	------	12	12
May 19 (Naval Observatory)	10	38	+22.0	69.3	+12.0	------	25	25

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.*	°	°	°			
May 20 (Naval Observatory)	12	23	+36.0	69.1	+12.0	------	46	46
May 21 (Naval Observatory)	10	34	+49.0	69.9	+12.0	------	46	46
May 22 (Naval Observatory)	11	13	+63.0	70.3	+12.0	------	93	93
May 23 (Naval Observatory)	11	26	−26.0	327.9	+9.0	------	28	------
			+76.0	69.9	+12.0	------	93	121
May 24 (Naval Observatory)	10	19	−15.0	326.3	+10.0	------	12	12
May 26 (Mount Wilson)	12	30	+40.0	353.6	+11.0	6	------	6
May 27 (Naval Observatory)	10	20	No spots			------	------	------
May 28 (Naval Observatory)	11	35	No spots			------	------	------
May 29 (Naval Observatory)	13	56	No spots			------	------	------
May 31 (Mount Wilson)	9	26	No spots			------	------	------
Mean daily area for May	------		------	------	------	------	------	15

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR MAY 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]

May 1933	Relative numbers	May 1933	Relative numbers	May 1933	Relative numbers
1	0	11	0	21	12
2	8	12	0	22	11
3	0	13	0	23	17
4	0	14	0	24	12
5	0	15	0	25	8
6	0	16	0	26	0
7	0	17	------	27	------
8	0	18	0	28	0
9	8	19	8	29	------
10	8	20	12	30	0
				31	0

Mean: 28 days=3.7.

AEROLOGICAL OBSERVATIONS

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

By L. T. SAMUELS

Free-air temperatures during May were considerably above normal at the stations shown in table I, except at Norfolk where they were close to normal. Notwithstanding the positive temperature departures, those of relative humidity were likewise positive at most stations.

In most cases the free-air resultant wind velocities for the month exceeded the normals, except in the upper Mississippi Valley and Upper Lakes region where they were below normal. Resultant wind directions were, in general, close to normal, except in the southern section where a preponderance of southerly winds occurred.

Upper-air observations were discontinued on April 30, 1933, at Ellendale incident to closing the station on June 30. Hence all the data given in table I are based on airplane observations.

TABLE 1.—*Free-air temperatures and relative humidities obtained by airplanes during May 1933*

Altitude (meters) m.s.l.	Atlanta, Ga. (303 meters)[1]		Boston, Mass. (6 meters)[2]		Chicago, Ill. (187 meters)[3]		Cleveland, Ohio (246 meters)[2]		Dallas, Tex. (146 meters)[4]		Norfolk, Va. (3 meters)[5]		Omaha, Nebr. (300 meters)[6]		Pensacola, Fla. (2 meters)[5]		San Diego, Calif. (9 meters)[5]		Washington, D.C. (2 meters)[5]	
	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	Mean	Departure from normal
Surface	18.3	(7)	15.4	(7)	13.6	(7)	13.8	(7)	20.1	(7)	18.2	−0.4	12.3	(7)	24.1	+1.4	16.4	−1.7	16.4	−1.4
500	19.8	(7)	11.8	(7)	13.8	(7)	14.9	(7)	20.9	(7)	17.1	−0.7	12.8	(7)	22.7	+1.9	12.2	−2.0	16.3	+0.7
1,000	19.6	+4.8	9.2	+1.2	12.4	+2.1	13.0	+2.7	19.6	+3.0	16.0	+0.1	12.4	+0.4	20.6	+2.4	11.5	−2.3	15.8	+2.3
1,500	16.7	+5.0	6.6	+1.7	10.5	+3.0	10.6	+3.1	18.0	+3.3			10.8	+1.6						
2,000	13.3	+4.5	4.8	+2.6	8.0	+3.0	7.8	+2.8	15.5	+3.2	10.8	+0.6	8.9	+2.3	15.5	+2.6	8.8	−2.2	10.8	+2.3
2,500	10.1	+4.1	2.5	+2.8	5.2	+2.6	5.0	+2.4	12.8	+3.2			6.2	+2.3						
3,000	7.4	+4.4	−0.4	+2.5	2.6	+2.6	2.4	+2.4	10.2	+3.6	5.5	+1.1	2.9	+1.9	10.5	+2.8	4.8	−0.8	5.4	+2.4
4,000	0.4	+3.5	−5.9		−3.6	+2.1	−3.4	+2.3	3.9	+3.5			−4.1	+0.7	4.9	+2.9	−1.5	−0.9	0.5	+3.2
5,000	−6.9	+3.1	−11.4		−9.7	+2.0	−9.2	+2.5	−2.8	+2.5			−10.9	−0.2	−2.5	+2.9				
RELATIVE HUMIDITY (PERCENT)																				
Surface	85	(7)	63	(7)	87	(7)	81	(7)	85	(7)	75	+5	83	(7)	82	+2	69	0	78	+12
500	76	(7)	63	(7)	80	(7)	71	(7)	73	(7)	70	+9	78	(7)	78	+4	75	−1	69	+8
1,000	65	+1	61	−10	73	+9	68	+4	67	−2	61	+6	70	+8	71	+5	66	+4	65	+7
1,500	62	−2	60	−15	69	+7	70	+8	55	−3			65	+3						
2,000	60	−2	56	−20	64	+6	68	+10	51	+2	58	+6	57	−3	58	+5	43	+4	65	+7
2,500	57	−2	52	−19	60	+8	66	+14	45	0			52	−6						
3,000	47	−8	53	−12	53	+5	63	+15	41	−4	52	+1	48	−10	43	+1	31	+3	59	+5
4,000	41	−11	46		50	+5	61	+16	35	−11			45	−14	23	0	26	+3	47	−2
5,000	38	−12	45		45	+1	50	+6	33	−20			42	−20	18	0				

Weather Bureau observations made near 5 a.m.; Navy observations near 7 a.m. (75th meridian time).

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

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 7 a.m. (E.S.T.) during May 1933*

[Wind from N=360°; E=90°, etc.]

Altitude (meters) m.s.l.	Albuquerque, N. Mex. (1,554 meters)		Atlanta, Ga. (309 meters)		Bismarck, N.Dak. (518 meters)		Brownsville, Tex. (12 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,873 meters)		Chicago, Ill. (192 meters)		Cleveland, Ohio (245 meters)		Dallas, Tex. (154 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (14 meters)		Key West, Fla. (11 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	308	1.6	227	0.5	22	0.5	139	2.7	191	2.3	287	4.4	160	0.2	181	1.6	156	2.9	223	1.1	225	0.5	119	3.4
500			227	2.2			159	8.9	216	3.7			218	3.3	218	3.6	176	7.2			209	3.7	121	7.0
1,000			242	4.4	209	1.3	159	8.5	268	4.9			257	3.2	252	4.6	201	7.5	250	2.3	197	2.9	122	5.9
1,500			253	5.4	199	1.0	161	6.4	293	6.7			260	5.0	255	5.8	214	4.4	312	3.6	189	2.4	122	4.9
2,000	266	2.4	248	6.2	164	1.1	150	4.8	291	7.8	277	5.4	254	5.0	259	6.5	248	4.1	279	2.4	231	2.1	121	4.1
2,500	258	4.0	247	5.6	303	1.4	103	1.6	301	9.5	269	6.5	260	4.5	258	6.8	300	4.9	272	3.4	241	2.4	113	3.6
3,000	258	5.5	255	5.2	272	3.2	55	1.4	303	9.9	282	6.6	300	4.3	269	7.5	312	5.5	261	5.1	230	2.7	103	2.3
4,000	261	10.2	270	4.3	267	3.6	38	1.7	302	12.9	276	7.4			264	7.1	336	5.2	272	7.6	240	1.4	331	4.8
5,000	268	10.8	287	3.5							264	8.7			276	7.7			237	5.3	298	3.0	309	8.4

Altitude (meters) m.s.l.	Los Angeles, Calif. (217 meters)		Medford, Oreg. (410 meters)		Memphis, Tenn. (83 meters)		New Orleans, La. (1 meter)		Oakland, Calif. (8 meters)		Oklahoma City, Okla. (402 meters)		Omaha, Nebr. (306 meters)		Phoenix, Ariz. (338 meters)		Salt Lake City, Utah (1,294 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (14 meters)		Washington, D. C. (10 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	41	0.8	294	0.4	176	1.5	121	1.0	254	1.0	169	2.2	93	1.0	301	0.1	154	2.3	80	1.6	130	1.9	331	0.5
500	39	1.0	311	0.7	204	5.6	156	3.7	295	4.2	185	4.1	255	0.8	264	2.4			87	3.9	202	5.1	279	3.7
1,000	353	3.7	300	0.8	227	6.7	170	3.4	311	6.4	212	8.2	252	5.0	276	3.9			108	1.3	199	5.4	284	4.7
1,500	312	3.1	211	1.8	225	6.2	155	1.9	301	6.0	238	7.6	257	7.4	282	4.6	165	2.6	291	1.9	204	4.8	275	5.0
2,000	310	4.4	236	4.2	233	6.1	178	2.4	303	5.6	246	7.7	273	8.3	268	4.6	187	2.6	297	3.3	221	5.1	279	5.5
2,500	310	6.3	249	5.7	264	7.0	204	2.2	304	7.2	258	8.5	285	9.0	251	5.4	208	1.5	311	4.8	231	6.0	287	6.5
3,000	303	7.2	252	6.1	272	7.1	256	2.4	300	7.5	263	7.4	281	9.1	250	5.9	254	2.7	316	4.8	220	6.8	277	8.7
4,000	288	7.3	248	8.8	243	1.9	298	4.7	299	11.8	274	6.2	297	9.3	239	9.3	230	4.0	291	7.8			273	8.8
5,000									268	5.4					259	8.4			288	10.8			279	11.2