SOLAR OBSERVATIONS

SOLAR RADIATION OBSERVATIONS DURING JULY 1937

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For a description of instruments employed and their exposures, the reader is referred to the January 1935 REVIEW, page 24.

Table 1 shows that solar radiation intensities averaged above normal for July at Washington, and below normal at Madison and Lincoln. The values for Madison show markedly the effect of increasing contamination of the atmosphere with increasing factory activity.

Table 2 shows an excess in the amount of total solar and sky radiation received on a horizontal surface at all stations with the exception of Washington, Miami, and Riverside.

Owing to transmission tests now being made on the red and yellow filters used for turbidity studies, no component-radiation measurements were made at either Washington or Blue Hill during July.

Polarization measurements made at Madison on 12 days gives a mean of 60 percent with a maximum of 61 percent on the 27th. The average value is close to the corresponding normal for the month, but the maximum is slightly below the July normal.

Recalibration of color screens in use at the Blue Hill Observatory.—The desirability of a recalibration of the color screens in use at the Blue Hill Observatory, with the object of determining their possible departures from the mean transmissions of such screens as determined by Fuessner, has long been realized. Arrangements were therefore made, through the courtesy of I. F. Hand of the Weather Bureau, to have such tests conducted at the Bureau of Chemistry and Soils of the Department of Agriculture in Washington, and the screens were shipped on July 17.

Unexpected difficulties were encountered in making the calibrations, and the results have not been received in time to be used in computing values of β and w from screened readings obtained on July 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, and 16. The computation and publication of these results is therefore deferred, pending the completion of the determination of new transmission coefficients therefrom.—*H. H. K.*

TABLE 1.—*Solar radiation intensities during July 1937*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance										
	8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A. M.				[1] 1.0	P. M.				
	e	5.0	4.0	3.0	2.0		2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
July 7	17.37	------	0.48	0.66	0.82	1.16	------	------	------	------	18.59
July 12	17.96	0.71	.78	.87	1.18	------	------	------	------	------	19.23
July 22	14.10	------	------	1.10	1.24	1.48	------	------	------	------	20.57
July 23	16.20	------	1.03	1.16	1.27	1.49	------	------	------	------	13.61
July 24	15.11	------	.58	1.00	1.26	1.45	------	------	------	------	15.11
Means	------	.71	.72	.96	1.13	1.40	------	------	------	------	------
Departures	------	+.12	+.04	+.17	+.20	+.17	------	------	------	------	------

[1] Extrapolated.

TABLE 1.—*Solar radiation intensities during July 1937*—Contd.

[Gram-calories per minute per square centimeter of normal surface]

MADISON, WIS.

Date	Sun's zenith distance										
	8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A. M.				[1] 1.0	P. M.				
	e	5.0	4.0	3.0	2.0		2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
July 1	8.48	------	------	------	------	1.48	------	------	------	------	7.87
July 6	14.60	------	0.65	------	1.00	1.34	------	------	------	------	14.10
July 7	13.61	------	------	------	1.05	1.30	------	------	------	------	14.10
July 9	15.65	------	------	------	.63	.88	------	------	------	------	16.79
July 19	11.38	------	.60	------	.99	1.15	------	------	------	------	11.81
July 20	8.81	------	------	------	.83	1.10	------	------	------	------	9.83
July 24	14.60	------	.76	0.88	1.06	------	------	------	------	------	17.37
July 26	8.48	------	.95	1.01	1.30	1.47	------	------	------	------	7.57
July 27	7.04	0.94	1.05	1.10	1.28	1.46	------	------	------	------	8.48
July 28	12.68	------	------	------	------	1.30	------	------	------	------	9.47
July 29	7.87	------	------	.67	.92	1.28	------	------	------	------	8.48
July 30	10.21	------	------	.70	.92	1.24	------	------	------	------	11.38
July 31	10.21	------	------	.65	.84	1.10	------	------	------	------	10.21
Means	------	(.94)	.80	.85	.98	1.26	------	------	------	------	------
Departures	------	+.26	+.02	−.07	−.08	−.04	------	------	------	------	------

LINCOLN, NEBR.

July 2	9.83	------	0.95	1.08	1.27	1.45	1.11	0.92	0.76	0.66	9.14
July 3	13.61	0.69	.82	.97	1.16	1.35	------	------	------	------	13.61
July 6	12.68	------	------	.92	1.08	1.29	1.02	.85	.70	.59	13.13
July 7	16.20	.65	.74	.89	1.09	1.42	------	------	------	------	10.97
July 9	15.65	.47	.58	.75	.95	------	------	------	------	------	11.81
July 10	9.83	------	.68	.85	------	------	------	------	------	------	9.47
July 14	16.20	------	.75	.90	1.11	1.30	------	------	------	------	17.37
July 15	15.65	.68	.81	.96	1.12	------	1.17	.90	.75	.64	16.20
July 16	14.10	------	------	------	1.06	------	1.09	.90	------	------	11.38
July 17	10.21	------	------	------	1.04	1.35	------	------	------	------	10.21
July 21	16.20	------	------	------	1.18	------	------	------	------	------	12.68
July 22	15.65	.66	.79	.95	1.15	1.40	1.06	.84	------	------	11.38
July 26	10.97	.64	.81	.91	1.05	1.41	------	------	------	------	11.38
July 30	15.11	------	.80	.88	1.06	1.29	------	------	------	------	7.07
Means	------	.63	.77	.91	1.10	1.36	1.09	.88	.74	.63	------
Departures	------	−.06	−.02	−.01	+.01	+.03	+.02	−.01	−.02	−.06	------

BLUE HILL, MASS.

July 1	13.7	------	------	------	------	1.40	0.98	------	------	------	9.7
July 2	9.6	------	------	------	------	1.22	.98	------	------	------	9.9
July 3	13.2	------	------	------	------	1.22	.95	------	------	------	13.8
July 4	13.2	------	------	0.73	0.93	1.19	1.06	------	------	------	13.0
July 5	14.7	------	------	------	1.00	1.22	.95	------	------	------	13.0
July 6	12.8	------	------	------	1.22	1.22	.96	------	------	------	13.2
July 8	15.6	------	------	------	------	1.19	------	------	------	------	15.5
July 9	18.8	------	------	------	.84	1.00	------	------	------	------	15.5
July 10	13.7	------	------	------	.84	1.11	.73	------	------	------	12.3
July 11	15.3	------	------	------	.78	1.08	------	------	------	------	10.4
July 13	11.9	------	------	------	------	1.53	1.13	------	------	------	12.1
July 14	10.3	------	------	------	1.22	1.42	1.11	------	------	------	9.6
July 16	19.5	------	------	------	------	1.14	1.00	0.69	------	------	19.8
July 17	11.9	------	------	1.07	1.11	1.34	------	------	------	------	18.5
July 18	14.7	------	------	1.07	1.15	1.37	------	------	------	------	13.7
July 20	13.7	------	------	------	1.00	1.32	1.08	------	------	------	11.5
July 21	13.7	------	------	------	------	1.37	1.15	1.04	0.98	.92	8.8
July 22	11.9	------	------	1.03	1.19	1.38	1.08	.94	.89	.85	9.7
July 23	12.8	------	------	.63	.87	1.22	.61	.54	.46	.42	15.8
July 24	14.7	0.37	0.46	.53	.60	.98	------	------	------	------	15.9
July 25	16.4	------	.33	.44	.69	.99	------	------	------	------	15.0
July 26	19.5	------	------	------	------	1.20	------	------	------	------	19.1
July 27	15.8	------	------	------	------	1.10	------	------	------	------	11.1
July 28	10.3	.90	1.02	1.09	1.21	1.41	.72	------	------	------	9.6
July 29	11.5	------	------	.89	1.08	1.33	1.06	.90	------	------	10.3
July 30	15.3	------	------	------	------	1.19	------	------	------	------	11.5
Means	------	(.64)	.60	.91	1.05	1.26	1.01	.91	.82	.74	------
Departures	------	------	.00	−.08	−.07	−.02	−.04	−.09	−.04	−.01	------

[1] Extrapolated.

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

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	Blue Hill	San Juan	Friday Harbor	Ithaca	Newport
	Gram-calories per square centimeter																
1937	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
July 2	476	659	713	518	471	744	427	--------	531	457	444	576	586	690	602	583	575
July 9	418	653	632	382	391	663	538	609	625	531	440	595	464	543	645	383	483
July 16	459	666	666	--------	492	691	396	621	451	543	477	528	561	658	648	517	558
July 23	525	608	591	536	504	651	416	537	455	411	439	483	511	651	652	417	545
	Departures from weekly normals																
July 2	−35	+125	+118	+49	+16	+35	−15	--------	--------	−51	+36	−41	+38	--------	+28	+57	--------
July 9	−75	+17	+44	−71	−58	−31	+46	+8	--------	+6	+39	−5	−64	--------	+79	−132	--------
July 16	−24	+141	+79	--------	+61	+26	−12	+14	--------	+24	+56	−44	+50	--------	+6	+15	--------
July 23	+35	+95	+35	+68	+74	+9	−15	−31	--------	−74	+64	−56	+5	--------	+37	−61	--------
	Accumulated departures on July 29																
	−1,561	+3,850	+714	+1,024	−4,284	+3,773	+1589	--------	--------	−6,244	+6,671	−3,416	−686	--------	+140	−3,539	--------

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent, U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	Eastern standard time		Mount Wilson group number	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1937	*h.*	*m.*		°	°	°				
July 1	11	6	5433	−62.0	292.5	+15.0	--------	97	--------	U. S. Naval.
			5431	−5.0	349.5	+16.0	--------	242	--------	
			5430	+23.0	17.5	+17.5	--------	73	--------	
			5423	+46.0	40.5	−17.0	194	--------	--------	
			5419	+61.0	55.5	−11.0	--------	194	800	
July 2	11	9	5436	−79.0	262.2	+17.0	97	--------	--------	Do.
			5435	−62.0	279.2	+12.0	6	--------	--------	
			5433	−50.0	291.2	+14.0	--------	48	--------	
			5434	−24.5	316.7	+10.5	24	--------	--------	
			5432	−16.0	325.2	−14.0	24	--------	--------	
			5431	+10.0	351.2	+16.0	--------	436	--------	
			5423	+59.0	40.2	−17.5	145	--------	--------	
			5419	+74.0	55.2	−12.0	145	--------	925	
July 3	10	26	5436	−65.0	263.4	+16.5	36	--------	--------	Do.
			5435	−48.0	280.4	+12.0	--------	48	--------	
			5433	−38.5	289.9	+14.0	--------	48	--------	
			5437	−29.0	299.4	−19.0	--------	24	--------	
			5431	+23.0	351.4	+16.0	--------	582	--------	
			5423	+70.0	38.4	−17.5	194	--------	932	
July 4	10	44	5440	−85.0	230.0	−19.0	--------	242	--------	Do.
			5436	−52.0	263.0	+16.5	36	--------	--------	
			5435	−34.0	281.0	+11.0	--------	97	--------	
			5439	−31.5	283.5	−10.0	--------	24	--------	
			5433	−24.5	290.5	+14.0	--------	73	--------	
			5437	−14.0	301.0	−19.0	--------	48	--------	
			5431	+36.0	351.0	+16.0	--------	485	1,005	
July 5	11	47	5440	−70.0	231.2	−20.0	--------	630	--------	Mt. Wilson.
			5436	−40.0	261.2	+17.0	48	--------	--------	
			5435	−21.0	280.2	+12.0	--------	291	--------	
			5439	−16.0	285.2	−10.5	--------	12	--------	
			5433	−9.5	291.7	+14.0	12	--------	--------	
			5437	+1.0	302.2	−19.0	--------	48	--------	
			5431	+50.0	351.2	+17.0	--------	485	1,526	
July 6	13	52	5445	−81.0	205.8	−9.0	194	--------	--------	U. S. Naval.
			5444	−78.0	208.8	+10.0	388	--------	--------	
			5440	−56.0	230.8	−20.0	--------	776	--------	
			5441	−31.0	255.8	+22.0	--------	145	--------	
			5436	−26.0	260.8	+17.5	36	--------	--------	
			5435	−6.0	280.8	+12.0	--------	388	--------	
			5437	+18.0	304.8	−19.0	--------	36	--------	
			5443	+31.0	317.8	+12.0	--------	12	--------	
			5442	+35.0	321.8	−9.0	--------	48	--------	
			5431	+63.0	349.8	+17.0	--------	533	2,556	
July 7	11	15	5447	−85.0	190.0	+15.5	194	--------	--------	Do.
			5446	−79.0	196.0	−15.0	97	--------	--------	
			5445	−68.0	207.0	−8.0	97	--------	--------	
			5444	−65.0	210.0	+10.5	388	--------	--------	
			5440	−45.0	230.0	−19.0	--------	582	--------	
			5441	−19.0	256.0	+23.0	--------	485	--------	
			5436	−14.0	261.0	+18.0	36	--------	--------	
			5435	+7.0	282.0	+12.5	--------	485	--------	
			5437	+28.0	303.0	−18.0	--------	145	--------	
			5431	+74.0	349.0	+17.0	--------	388	2,897	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time		Mount Wilson group number	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1937	*h.*	*m.*		°	°	°				
July 8	11	7	5454	−81.0	180.8	−10.5	218	--------	--------	U. S. Naval.
			5453	−79.0	182.8	+11.0	--------	24	--------	
			5452	−75.0	186.8	−11.0	--------	436	--------	
			5447	−70.5	191.3	+15.0	242	--------	--------	
			5446	−66.0	195.8	−15.0	--------	242	--------	
			5445	−56.0	205.8	−8.5	97	--------	--------	
			5450	−56.0	205.8	+9.0	--------	48	--------	
			5444	−50.5	211.3	+10.0	339	--------	--------	
			5440	−31.0	230.8	−19.5	--------	533	--------	
			5441	−7.0	254.8	+23.0	--------	582	--------	
			5441	−2.0	259.8	+21.5	436	--------	--------	
			5436	−1.0	260.8	+18.5	24	--------	--------	
			5449	+5.0	266.8	+12.0	--------	24	--------	
			5435	+19.0	280.8	+12.5	--------	582	--------	
			5437	+40.0	301.8	−19.0	--------	218	4045	
July 9	12	1	5455	−79.0	169.1	−16.0	--------	679	--------	Do.
			5453	−68.0	180.1	+13.0	--------	194	--------	
			5454	−64.0	184.1	−10.0	291	--------	--------	
			5452	−61.0	187.1	−10.0	--------	339	--------	
			5447	−58.0	190.1	+15.0	242	--------	--------	
			5446	−50.0	198.1	−14.0	--------	170	--------	
			5451	−41.0	207.1	−14.0	--------	36	--------	
			5445	−40.5	207.6	−8.0	145	--------	--------	
			5450	−40.5	207.6	+9.5	--------	121	--------	
			5444	−38.0	210.1	+10.5	291	--------	--------	
			5440	−18.0	230.1	−19.5	--------	436	--------	
			5441	−6.0	242.1	+23.0	--------	679	--------	
			5436	+11.5	259.6	+19.0	24	--------	--------	
			5441	+12.5	260.6	+21.5	533	--------	--------	
			5449	+20.0	268.1	+13.0	--------	12	--------	
			5435	+32.0	280.1	+13.0	--------	436	--------	
			5437	+55.0	303.1	−19.5	--------	170	4,798	
July 10	11	2	5456	−76.0	159.4	+25.0	97	--------	--------	Do.
			5455	−69.0	166.4	−16.5	--------	485	--------	
			5453	−53.0	182.4	+14.0	--------	339	--------	
			5454	−51.0	184.4	−10.5	291	--------	--------	
			5459	−49.0	186.4	+20.5	--------	24	--------	
			5452	−48.0	187.4	−10.0	--------	291	--------	
			5447	−43.0	192.4	+15.0	339	--------	--------	
			5446	−38.0	197.4	−14.0	194	--------	--------	
			5445	−28.5	206.9	−8.0	121	--------	--------	
			5451	−28.5	206.9	−12.5	--------	97	--------	
			5450	−28.0	207.4	+9.5	--------	388	--------	
			5444	−24.0	211.4	+10.5	291	--------	--------	
			5440	−5.0	230.4	−19.0	--------	412	--------	
			5458	+0.5	235.9	+10.5	--------	24	--------	
			5441	+21.0	256.4	+23.0	--------	1600	--------	
			5457	+21.0	256.4	−30.0	--------	24	--------	
			5436	+25.0	260.4	+19.0	24	--------	--------	
			5435	+47.0	282.4	+13.0	--------	388	--------	
			5437	+69.0	304.4	−20.0	--------	291	5,720	
July 11	12	3	5460	−69.0	152.6	+30.0	24	--------	--------	Do.
			5456	−63.0	158.6	+26.0	--------	73	--------	
			5455	−55.0	166.6	−17.0	--------	436	--------	
			5454	−38.0	183.6	−11.0	218	--------	--------	
			5453	−38.0	183.6	+13.0	--------	242	--------	
			5452	−33.0	188.6	−12.0	--------	194	--------	
			5459	−33.0	188.6	+20.0	--------	24	--------	
			5447	−29.0	192.6	+14.0	315	--------	--------	
			5446	−23.0	198.6	−14.5	194	--------	--------	
			5450	−15.0	206.6	+9.0	--------	436	--------	
			5445	−13.0	208.6	−9.0	97	--------	--------	
			5451	−13.0	208.6	−13.0	--------	48	--------	
			5444	−11.0	210.6	+10.5	291	--------	--------	