SOLAR OBSERVATIONS

[Meteorological Research Division, EDGAR W. WOOLARD in charge]

SOLAR RADIATION OBSERVATIONS, JUNE 1938

By CHARLES M. LENNAHAN

Measurements of solar radiant energy received at the surface of the earth are made at eight stations maintained by the Weather Bureau, and at nine cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory of Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data, obtained up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parenthesis). At Madison and Lincoln the observations are made with the Marvin pyrheliometer; at Washington and Blue Hill they are obtained with a recording thermopile, checked by observations with a Marvin pyrheliometer at Washington and with a Smithsonian silver disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 8 a. m. (75th meridian time) and at noon (local mean solar time).

During July 1938 direct solar radiation intensities averaged above normal at Blue Hill, Madison, and Lincoln.

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentionmeter.

Six stations for which normals exist received an excess of total solar and sky radiation during July 1938. Nine of the stations received a deficiency of total radiation during the month.

Polarization measurements were made on 7 days at Madison giving a mean value of 37.1 percent and a maximum of 56.3 percent on the 28th; both of these values are below the corresponding normals for the month.

TABLE 1.—*Solar radiation intensities during July 1938*

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

WASHINGTON, D. C.

No observations were obtained at Washington due to cloudy weather and instrumental trouble.

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.					P. M.				
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
July 4	12.68	------	0.71	------	------	1.42	------	------	------	------	13.13
July 6	13.13	------	------	------	------	1.13	------	------	------	------	19.89
July 9	14.60	0.88	.98	1.10	1.26	1.47	------	------	------	------	15.65
July 11	17.37	.74	.86	------	1.18	1.40	------	------	------	------	15.11
July 12	16.20	------	.86	------	1.00	------	------	------	------	------	18.59
July 14	11.38	.80	.90	------	1.23	1.41	------	------	------	------	11.38
July 15	9.47	------	------	------	1.26	------	------	------	------	------	10.97
July 18	12.68	.84	.92	------	1.17	1.37	------	------	------	------	10.21
July 19	11.81	.65	.74	------	------	------	------	------	------	------	14.60
July 28	13.13	.78	.91	1.06	1.23	------	------	------	------	------	13.61
July 29	12.24	------	------	------	------	1.33	------	------	------	------	14.60
Means	------	.78	.85	(1.01)	1.19	1.36	------	------	------	------	------
Departures	------	+.08	+.07	+.09	+.12	+.06	------	------	------	------	------

LINCOLN, NEBR.

July 1	16.79	------	------	------	1.04	1.37	------	------	------	------	18.59
July 2	17.37	------	------	------	------	1.36	1.02	------	------	------	18.59
July 4	15.65	------	0.80	0.94	1.11	------	------	------	------	------	10.21
July 5	14.10	------	------	------	------	------	------	------	------	------	------
July 8	12.68	------	.99	1.10	1.26	1.46	------	------	------	------	10.21
July 9	12.68	------	.86	1.00	1.17	------	------	------	------	------	12.68
July 10	16.20	------	------	.84	1.06	------	------	------	------	------	12.68
July 11	14.10	------	------	------	1.28	------	------	------	------	------	9.83
Means	------	------	.88	.97	1.13	1.40	(1.02)	------	------	------	------
Departures	------	------	+.09	+.05	+.04	+.06	−.05	------	------	------	------

BLUE HILL, MASS.

July 2	14.2	------	------	------	------	1.32	1.07	------	------	------	12.3
July 3	7.9	------	------	------	------	------	1.05	------	------	------	9.9
July 4	8.6	------	------	------	------	------	1.33	1.21	------	------	9.6
July 5	10.7	------	------	------	1.08	1.23	------	------	------	------	11.5
July 7	10.3	------	------	------	------	1.28	------	------	------	------	10.3
July 8	13.2	------	------	------	.86	1.14	.94	------	------	------	16.4
July 9	15.3	------	------	------	------	1.26	------	------	------	------	18.2
July 10	16.9	------	------	------	------	1.27	1.08	------	------	------	15.3
July 16	11.9	------	------	0.96	1.12	1.38	------	------	------	------	13.2
July 30	18.2	------	------	------	------	1.33	------	------	------	------	14.7
July 31	13.7	------	------	------	------	1.29	------	------	------	------	14.7
Means	------	------	------	(0.96)	1.02	1.28	1.09	(1.21)	------	------	------
Departures	------	------	------	+.05	−.03	+.01	+.07	+.28	------	------	------

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																
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
July 2	583	540	642	525	619	760	444	521	566	354	(1)	576	581	659	580	--------	615
July 9	474	611	699	498	420	727	445	586	468	456	(1)	543	458	626	616	--------	549
July 16	391	592	530	484	268	713	538	643	553	480	299	513	318	623	626	--------	342
July 23	363	539	556	510	273	667	530	560	411	475	442	579	368	658	543	--------	473
	Departures of daily totals from normals																
July 2	+69	+6	+45	+52	+153	+46	+1	−75	−6	−137	(1)	−34	0	+61	+5	--------	--------
July 9	−18	+73	+105	+42	−27	+30	−40	−14	−120	−61	(1)	−47	−34	+26	+41	--------	--------
July 16	−88	+65	−54	+22	−152	+23	+111	+33	+1	−35	−107	−49	−171	+11	−15	--------	--------
July 23	−122	+25	0	+39	−147	+4	+85	−8	−47	−37	+59	+33	−93	+61	−60	--------	--------
	Accumulated departures since Jan. 1																
	−10,686	−2,345	−1,246	+4,095	−630	−1,778	+4,809	−7,576	−3,640	−4,095	+4,144	−4,298	−3,997	+8,468	+8,050	--------	--------

[1] No record from July 2 to July 18, inclusive, due to instrumental overhauling.

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		Mt. Wilson group No.	Heliographic			Area		Spot count	Observatory
				Diff. in longitude	Longitude	Latitude	Spot or group	Total for each day		
1938	*h*	*m*		°	°	°				
July 1	11	26	5968	−80.0	136.8	−7.0	145	-------	1	U. S. Naval.
			5962	−21.0	195.8	−7.0	182	-------	1	
			5957	−12.0	204.8	−10.0	436	-------	58	
			5961	−5.0	211.8	−21.0	485	-------	37	
			5967	−1.0	215.8	−7.5	24	-------	2	
			5956	−0.5	216.3	+29.0	24	-------	4	
			5956	+7.0	223.8	+26.0	36	-------	6	
			5960	+24.5	241.3	+4.0	16	-------	3	
			5959	+30.0	246.8	−7.0	24	1,372	8	
July 2	11	30	5971	−74.0	129.5	+12.0	97	-------	1	Do.
			5968	−66.0	137.5	−7.0	97	-------	2	
			5970	−60.0	143.5	+14.0	36	-------	4	
			5962	−8.0	195.5	−9.0	145	-------	1	
			5957	+2.0	205.5	−10.5	436	-------	45	
			5961	+8.0	211.5	−21.5	436	-------	28	
			5967	+13.0	216.5	−7.5	24	-------	1	
			5956	+13.0	216.5	+28.0	36	-------	5	
			5956	+21.0	224.5	+25.0	48	-------	5	
			5959	+43.0	246.5	−7.0	24	-------	2	
			5969	+58.0	261.5	−8.0	12	1,391	1	
Suly 3	11	35	5971	−61.0	129.2	+12.0	97	-------	1	Do.
			5968	−55.0	135.2	−7.0	97	-------	6	
			5970	−47.5	142.7	+13.0	388	-------	15	
			5962	+7.0	197.2	−7.0	145	-------	2	
			5957	+15.0	205.2	−10.5	339	-------	30	
			5961	+21.0	211.2	−21.5	291	-------	25	
			5956	+30.0	220.2	+26.0	97	-------	15	
			5959	+58.0	248.2	−7.5	24	-------	1	
			5969	+70.0	260.2	−9.0	97	1,575	2	
July 4	12	3	5973	−80.0	96.7	−14.5	145	-------	4	Do.
			5972	−80.0	96.7	+13.0	194	-------	3	
			5971	−48.0	128.7	+12.0	48	-------	2	
			5968	−42.5	134.2	−7.0	97	-------	6	
			5970	−35.0	141.7	+12.5	630	-------	28	
			5962	+20.0	196.7	−7.0	121	-------	2	
			5957	+30.0	206.7	−10.5	485	-------	33	
			5961	+35.0	211.7	−21.5	242	-------	18	
			5956	+42.0	218.7	+27.0	145	2,107	15	
July 5	11	3	5976	−78.0	86.1	−15.0	48	-------	4	Do.
			5972	−68.0	96.1	+13.5	291	-------	4	
			5973	−67.0	97.1	−14.0	533	-------	16	
			5975	−50.0	114.1	+12.0	6	-------	5	
			5971	−36.0	128.1	+12.5	73	-------	2	
			5968	−30.0	134.1	−7.0	97	-------	6	
			5970	−22.0	142.1	+12.0	970	-------	18	
			5962	+32.0	196.1	−7.0	194	-------	1	
			5957	+41.0	205.1	−11.0	436	-------	23	
			5961	+47.0	211.1	−22.0	339	-------	8	
			5956	+54.0	218.1	+27.0	485	3,472	10	
July 6	11	8	5978	−84.0	66.8	−17.0	776	-------	5	Do.
			5977	−77.0	73.8	+15.0	24	-------	2	
			5976	−64.0	86.8	−16.0	61	-------	3	
			5973	−55.0	95.8	−14.0	776	-------	40	
			5972	−55.0	95.8	+14.0	242	-------	6	
			5975	−39.0	111.8	+13.0	109	-------	9	
			5971	−22.0	128.8	+11.5	48	-------	4	
			5968	−15.0	135.8	−8.0	73	-------	7	
			5970	−9.0	141.8	+12.0	921	-------	31	
			5974	+12.0	162.8	+17.5	48	-------	5	
			5962	+46.0	196.8	−7.0	145	-------	1	
			5957	+55.0	205.8	−11.5	388	-------	28	
			5961	+60.0	210.8	−22.0	339	-------	10	
			5956	+65.0	215.8	+27.0	485	4,435	15	
July 7	10	47	5978	−68.0	69.7	−17.5	679	-------	5	Do.
			5977	−61.0	76.7	+16.0	24	-------	2	
			5976	−50.0	87.7	−16.0	145	-------	10	
			5972	−41.0	96.7	+15.0	194	-------	6	
			5973	−40.0	97.7	−13.0	776	-------	66	
			5975	−26.0	111.7	+13.0	145	-------	19	
			5971	−9.0	128.7	+12.0	24	-------	2	
			5968	−1.0	136.7	−8.0	73	-------	6	
			5970	+4.5	142.2	+13.0	873	-------	22	
			5974	+26.0	163.7	+17.0	36	-------	5	
			5962	+60.0	197.7	−7.0	145	-------	2	
			5957	+70.0	207.7	−13.0	291	-------	10	
			5961	+75.0	212.7	−23.0	242	-------	2	
			5956	+79.0	216.7	+27.0	339	3,986	3	
July 8	11	38	5982	−81.0	43.0	−11.0	194	-------	2	Do.
			5978	−53.0	71.0	−17.5	485	-------	4	
			5977	−48.0	76.0	+15.0	24	-------	1	
			5979	−38.0	86.0	+19.0	12	-------	2	
			5976	−36.0	88.0	−15.0	97	-------	8	
			5980	−35.0	89.0	+15.0	6	-------	1	
			5972	−27.0	97.0	+15.0	194	-------	3	
			5973	−26.0	98.0	−13.0	873	-------	45	
			5975	−11.0	113.0	+14.5	97	-------	18	
			5971	+4.0	128.0	+15.0	6	-------	1	
			5968	+13.0	137.0	−7.0	73	-------	3	
			5970	+17.0	141.0	+14.0	776	-------	18	
			5974	+40.0	164.0	+19.0	48	-------	4	
			5981	+65.0	189.0	−21.0	6	-------	2	
			5962	+75.0	199.0	−6.0	145	-------	1	
			5961	+85.0	209.0	−21.0	97	3,133	1	

Positions and areas of sun spots—Continued

Date	Eastern standard time		Mt. Wilson group No.	Heliographic			Area		Spot count	Observatory
				Diff. in longitude	Longitude	Latitude	Spot or group	Total for each day		
1938	*h*	*m*		°	°	°				
July 9	11	24	5985	−86.0	24.9	+5.0	485	-------	1	U. S. Naval.
			5984	−84.0	26.9	+7.0	48	-------	3	
			5983	−78.0	32.9	+9.0	194	-------	3	
			5982	−71.0	39.9	−11.0	873	-------	20	
			5981	−49.0	61.9	−21.0	6	-------	2	
			5978	−41.0	69.9	−17.0	485	-------	15	
			5977	−32.5	78.4	+16.0	6	-------	2	
			5976	−24.0	86.9	−13.0	73	-------	10	
			5973	−14.0	96.9	−14.0	1,212	-------	60	
			5972	−14.0	96.9	+15.0	242	-------	5	
			5975	+2.0	112.9	+15.0	97	-------	18	
			5968	+26.5	137.4	−7.0	73	-------	2	
			5970	+30.0	140.9	+15.0	727	-------	25	
			5974	+53.0	163.9	+19.0	12	4,533	2	
July 10	11	11	5986	−71.0	26.8	−15.0	12	-------	1	Do.
			5985	−70.5	27.3	+5.0	291	-------	1	
			5984	−65.0	32.8	+7.0	97	-------	7	
			5983	−65.0	32.8	+11.0	97	-------	11	
			5982	−59.5	38.3	−11.0	1,454	-------	40	
			5978	−29.0	68.8	−17.0	485	-------	20	
			5988	−20.0	77.8	−27.0	73	-------	6	
			5976	−11.0	86.8	−13.0	24	-------	2	
			5972	−2.0	95.8	+16.0	388	-------	25	
			5973	0.0	97.8	−13.5	1,309	-------	90	
			5975	+12.0	109.8	+15.0	48	-------	5	
			5975	+19.0	116.8	+14.0	36	-------	5	
			5978	+40.0	137.8	−7.0	6	-------	5	
			5970	+44.5	142.3	+13.0	582	4,902	15	
July 11	11	15	5986	−59.0	25.5	−15.0	16	-------	1	Do.
			5985	−55.0	29.5	+4.0	291	-------	1	
			5983	−50.0	34.5	+11.0	97	-------	10	
			5984	−49.0	35.5	+7.0	97	-------	10	
			5982	−46.0	38.5	−13.0	1,454	-------	49	
			5978	−15.5	69.0	−18.0	339	-------	30	
			5988	−7.5	77.0	−27.0	97	-------	10	
			5972	+13.0	97.5	+16.0	218	-------	28	
			5973	+14.0	98.5	−13.5	1,454	-------	96	
			5989	+14.0	98.5	+11.0	73	-------	7	
			5970	+57.0	141.5	+12.0	485	4,621	17	
July 12	13	22	5990	−86.0	344.1	+4.0	97	-------	1	Do.
			5986	−44.0	26.1	−15.0	24	-------	1	
			5985	−41.0	29.1	+4.0	242	-------	1	
			5984	−35.0	35.1	+7.0	48	-------	10	
			5983	−34.0	36.1	+11.0	121	-------	11	
			5982	−32.0	38.1	−14.0	1,842	-------	80	
			5978	−1.0	69.1	−18.0	339	-------	32	
			5988	+10.0	80.1	−26.0	48	-------	6	
			5972	+27.5	97.6	+17.0	121	-------	13	
			5973	+28.0	98.1	−13.5	1,454	-------	60	
			5989	+28.5	98.6	+11.0	73	-------	9	
			5970	+72.0	142.1	+12.0	388	4,797	10	
July 13	11	16	5990	−74.0	344.1	+5.0	194	-------	1	Do.
			5986	−32.0	26.1	−15.0	12	-------	1	
			5985	−29.0	29.1	+4.5	242	-------	1	
			5984	−23.0	35.1	+8.0	97	-------	10	
			5983	−21.5	36.6	+11.0	97	-------	9	
			5982	−20.0	38.1	−14.0	2,182	-------	100	
			5991	−12.5	45.6	+22.0	36	-------	7	
			5981	+4.0	62.1	−21.0	12	-------	5	
			5978	+11.0	69.1	−19.0	291	-------	22	
			5988	+22.0	80.1	−26.0	6	-------	1	
			5989	+40.0	98.1	+12.0	36	-------	6	
			5972	+40.0	98.1	+16.0	85	-------	6	
			5973	+40.0	98.1	−14.0	1,454	4,744	76	
July 14	13	59	5993	−60.0	343.3	−18.0	97	-------	9	Do.
			5990	−60.0	343.3	+5.0	121	-------	2	
			5986	−19.0	24.3	−15.0	12	-------	2	
			5985	−13.0	30.3	+4.5	218	-------	3	
			5982	−5.0	38.3	−14.0	2,473	-------	100	
			5983	−4.0	39.3	+11.5	36	-------	5	
			5984	−3.0	40.3	+7.0	73	-------	7	
			5991	+4.0	47.3	+23.0	24	-------	2	
			5981	+27.0	70.3	−19.0	73	-------	22	
			5978	+29.0	72.3	−17.0	121	-------	16	
			5988	+37.0	80.3	−26.0	6	-------	1	
			5973	+54.0	97.3	−14.0	1,309	-------	46	
			5972	+55.0	98.3	+16.0	73	-------	8	
			5989	+55.0	98.3	+12.0	24	4,660	2	
July 15	11	56	5993	−48.0	343.2	−17.5	145	-------	9	Do.
			5990	−48.0	343.2	+5.0	145	-------	2	
			5992	−41.0	350.2	+11.0	24	-------	3	
			5996	−31.0	0.2	−28.0	12	-------	4	
			5985	−1.0	30.2	+3.5	242	-------	3	
			5982	+8.0	39.2	−14.0	2,424	-------	105	
			5984	+8.0	39.2	+7.0	48	-------	9	
			5995	+11.0	42.2	+19.0	24	-------	4	
			5991	+16.0	47.2	+24.0	6	-------	1	
			5981	+35.0	66.2	−21.0	12	-------	1	
			5978	+40.0	71.2	−16.0	97	-------	8	
			5994	+49.5	80.7	+10.5	48	-------	5	
			5972	+56.0	87.2	+19.0	73	-------	5	
			5973	+67.0	98.2	−14.0	970	-------	30	
			5989	+68.5	99.7	+14.0	24	4,294	3	

Positions and areas of sun spots—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot or group	Area: Total for each day	Spot count	Observatory
1938	*h m*		°	°	°				
July 16	11 9	5998	−37.0	341.4	+18.5	12	-------	2	U. S. Naval.
		5993	−34.0	344.4	−17.0	109	-------	15	
		5990	−34.0	344.4	+5.5	145	-------	2	
		5992	−28.0	350.4	+11.0	24	-------	5	
		5996	−20.0	358.4	−26.5	36	-------	6	
		5985	+12.0	30.4	+4.0	206	-------	3	
		5983	+18.0	36.4	+10.0	12	-------	2	
		5982	+22.0	40.4	−14.0	2,133	-------	72	
		5995	+25.5	43.9	+19.0	36	-------	4	
		5978	+52.0	70.4	−15.0	48	-------	3	
		5994	+66.0	84.4	+10.0	73	-------	5	
		5972	+68.0	86.4	+19.0	97	-------	4	
		5973	+76.0	94.4	−15.0	582	3,513	7	
July 17	11 15	6000	−88.0	277.1	+16.0	194	-------	1	Do.
		5999	−50.0	315.1	+7.0	73	-------	10	
		5993	−21.0	344.1	−17.0	61	-------	8	
		5990	−20.0	345.1	+5.0	145	-------	1	
		5996	−9.0	356.1	−26.0	24	-------	4	
		5985	+26.0	31.1	+4.0	218	-------	6	
		5982	+35.0	40.1	−14.0	2,036	-------	70	
		5995	+39.0	44.1	+20.0	61	-------	20	
		5978	+68.0	73.1	−15.0	48	-------	2	
		5994	+78.0	83.1	+12.0	24	2,884	1	
July 18	11 14	6000	−74.0	277.9	+15.5	242	-------	2	Do.
		5999	−37.0	314.9	+7.0	48	-------	6	
		5998	−12.0	339.9	+20.0	12	-------	3	
		5990	−7.0	344.9	+5.0	97	-------	1	
		5993	−4.0	347.9	−17.0	12	-------	3	
		5992	+3.0	354.9	+12.0	12	-------	2	
		5996	+5.5	357.4	−26.0	16	-------	2	
		5985	+39.0	30.9	+4.0	218	-------	3	
		5982	+48.0	39.9	−14.0	1,939	-------	65	
		5995	+51.0	42.9	+20.0	242	2,838	22	
July 19	11 10	6005	−78.0	260.7	−11.0	121	-------	2	Do.
		6004	−65.0	273.7	+5.0	12	-------	4	
		6000	−60.0	278.7	+15.0	291	-------	3	
		6003	−55.0	283.7	−7.0	6	-------	2	
		5999	−22.0	316.7	+7.0	24	-------	5	
		5990	+7.5	346.2	+5.0	121		2	
		5993	+10.0	348.7	−17.0	6	-------	2	
		5992	+16.0	354.7	+12.5	36	-------	6	
		5985	+51.0	29.7	+4.0	206	-------	1	
		5982	+63.0	41.7	−15.0	2,133	-------	70	
		5995	+65.5	44.2	+20.0	97	3,053	10	
July 20	11 35	6007	−85.0	240.2	−20.0	48	-------	2	Do.
		6005	−63.0	262.2	−11.0	61	-------	2	
		6004	−52.0	273.2	+7.0	18	-------	2	
		6000	−47.0	278.2	+15.0	242	-------	1	
		6003	−40.0	285.2	−7.5	97	-------	9	
		5999	−7.0	318.2	+9.0	12	-------	3	
		6001	+16.0	341.2	+9.5	61	-------	4	
		5990	+21.0	346.2	+5.0	97	-------	4	
		5992	+29.0	354.2	+12.0	24	-------	5	
		6002	+35.0	.2	+5.5	24	-------	3	
		5985	+65.0	30.2	+4.5	242	-------	1	
		5982	+76.0	41.2	−15.0	3,103	4,029	40	
July 21	14 15	6012	−67.0	243.6	+3.0	48	-------	4	Mt. Wilson.
		6007	−66.0	244.6	−18.5	97	-------	5	
		6005	−50.0	260.6	−10.0	97	-------	1	
		6011	−48.0	262.6	+21.5	97	-------	17	
		6004	−38.5	272.1	+7.0	36	-------	6	
		6000	−34.5	276.1	+17.0	242	-------	3	
		6003	−25.0	285.6	−7.0	73	-------	10	
		6001	+32.0	342.6	+10.0	194	-------	17	
		5990	+36.0	346.6	+7.0	61	-------	1	
		5985	+80.0	30.6	+6.5	145	1,090	1	
July 22	13 11	6014	−74.0	223.9	−10.0	194	-------	3	U. S. Naval.
		6007	−56.0	241.9	−18.0	48	-------	5	
		6012	−54.0	243.9	+3.0	73	-------	12	
		6005	−38.0	259.9	−10.0	73	-------	2	
		6011	−35.0	262.9	+21.0	97	-------	20	
		6000	−31.0	266.9	+18.0	48	-------	14	
		6000	−21.0	276.9	+17.0	242	-------	7	
		6004	−27.0	270.9	+7.0	48	-------	8	
		6003	−13.0	284.9	−6.0	97	-------	15	
		6013	−7.0	290.9	+6.0	24	-------	5	
		6001	+44.0	341.9	+8.0	97	-------	14	
		5990	+48.0	345.9	+7.0	97	-------	2	
		5992	+57.0	354.9	+12.0	36	1,174	5	
July 23	9 50	6017	−85.0	201.5	−6.0	194	-------	1	Mt. Wilson.
		6016	−76.0	210.5	−21.0	485	-------	10	
		6014	−63.0	223.5	−8.0	242	-------	8	
		6007	−43.0	243.5	−17.0	73	-------	11	
		6012	−40.5	246.0	+3.0	97	-------	14	
		6005	−26.0	260.5	−9.5	73	-------	1	
		6011	−22.0	264.5	+22.0	388	-------	25	
		6000	−18.0	268.5	+19.0	48	-------	22	
		6000	−9.0	277.5	+17.5	291	-------	-------	
		6004	−13.0	273.5	+7.0	36	-------	6	
		6015	+1.0	287.5	+26.0	24	-------	3	
		6003	+1.0	287.5	−6.0	121	-------	18	
		6013	+7.0	293.5	+7.0	194	-------	22	
		6010	+41.0	327.5	+21.0	12	-------	1	
		6001	+58.0	344.5	+8.0	73	-------	11	
		5990	+61.0	347.5	+6.5	85	-------	3	
		5992	+71.0	357.5	+12.0	24	2,460	4	

Positions and areas of sun spots—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot or group	Area: Total for each day	Spot count	Observatory
1938	*h m*		°	°	°				
July 24	13 1	6017	−71.0	200.5	−7.0	194	-------	6	Mt. Wilson.
		6016	−64.0	207.5	−21.0	485	-------	15	
		6014	−48.0	223.5	−7.0	194	-------	5	
		6007	−29.0	242.5	−18.0	48	-------	12	
		6012	−25.0	246.5	+4.0	97	-------	10	
		6005	−11.0	260.5	−9.0	73	-------	1	
		6011	−5.0	266.5	+21.0	242	-------	14	
		6000	−4.0	267.5	+19.0	48	-------	9	
		6000	+3.5	275.0	+18.0	242	-------	-------	
		6004	+2.0	273.5	+7.0	61	-------	5	
		6003	+15.0	286.5	−7.0	121	-------	10	
		6013	+19.0	290.5	+7.0	291	-------	12	
		6010	+52.0	323.5	+22.0	36	-------	3	
		6001	+69.0	340.5	+7.5	48	-------	5	
		5990	+78.0	349.5	+6.0	61	2,241	1	
July 25	13 32	6017	−60.0	198.0	−9.5	388	-------	4	U. S. Naval.
		6017	−54.5	203.5	−9.0	73	-------	13	
		6016	−59.0	199.0	−26.0	97	-------	20	
		6016	−48.0	210.0	−22.0	485	-------	24	
		6014	−32.0	226.0	−9.0	170	-------	6	
		6007	−13.0	245.0	−19.0	24	-------	6	
		6012	−10.0	248.0	+3.0	145	-------	24	
		6005	+3.0	261.0	−10.0	48	-------	2	
		6011	+3.0	261.0	+21.0	121	-------	18	
		6000	+12.0	270.0	+19.0	73	-------	13	
		6000	+19.0	277.0	+18.0	145	-------	11	
		6018	+14.0	272.0	−17.0	6	-------	2	
		6004	+17.0	275.0	+6.0	24	-------	3	
		6015	+27.0	285.0	+25.0	36	-------	9	
		6003	+30.0	288.0	−7.0	145	-------	20	
		6013	+35.0	293.0	+7.0	582	-------	22	
		6001	+80.0	338.0	+8.0	6	2,568	1	
July 26	14 4	6017	−47.0	197.5	−9.5	291	-------	3	Do.
		6017	−39.0	205.5	−9.0	48	-------	4	
		6016	−45.0	199.5	−26.0	194	-------	14	
		6016	−35.0	209.5	−22.0	727	-------	34	
		6014	−19.0	225.5	−9.0	97	-------	5	
		6007	+2.0	246.5	−19.0	24	-------	7	
		6012	+4.0	248.5	+3.0	121	-------	17	
		6005	+17.0	261.5	−10.0	48	-------	4	
		6011	+22.0	266.5	+20.0	73	-------	12	
		6000	+32.0	276.5	+17.0	85	-------	10	
		6015	+40.0	284.5	+26.0	36	-------	3	
		6003	+45.0	289.5	−7.5	242	-------	31	
		6013	+48.0	292.5	+7.0	582	2,568	22	
July 27	10 55	6017	−35.0	198.0	−9.0	303	-------	7	Do.
		6017	−27.0	206.0	−9.0	36	-------	9	
		6016	−33.0	200.0	−27.0	97	-------	12	
		6016	−22.0	211.0	−22.5	533	-------	40	
		6014	−9.0	224.0	−9.0	97	-------	7	
		6012	+18.0	251.0	+3.0	97	-------	6	
		6005	+29.0	262.0	−10.5	36	-------	2	
		6011	+34.0	267.0	+20.0	121	-------	13	
		6000	+45.0	278.0	+16.0	73	-------	7	
		6015	+50.0	283.0	+25.0	6	-------	1	
		6003	+55.0	288.0	−8.0	339	-------	28	
		6013	+59.0	292.0	+7.0	533	2,271	20	
July 28	10 58	6022	−80.0	139.8	+18.0	6	-------	1	Do.
		6020	−32.0	187.8	+1.0	12	-------	3	
		6017	−21.0	198.8	−9.0	291	-------	28	
		6017	−13.0	206.8	−9.0	48	-------	5	
		6016	−19.0	200.8	−16.0	97	-------	25	
		6016	−9.0	210.8	−22.0	485	-------	30	
		6014	+6.0	225.8	−8.5	73	-------	9	
		6012	+29.0	248.8	+3.0	145	-------	17	
		6005	+41.0	260.8	−10.0	48	-------	2	
		6011	+48.0	267.8	+20.0	73	-------	11	
		6000	+56.0	275.8	+16.0	24	-------	8	
		6003	+70.0	289.8	−9.0	485	-------	13	
		6013	+74.0	293.8	+6.0	533	2,320	8	
July 29	11 48	6022	−68.0	138.1	+18.0	6	-------	2	Do.
		6020	−15.0	191.1	+3.0	24	-------	5	
		6017	−7.0	199.1	−7.0	315	-------	30	
		6017	+2.0	208.1	−7.0	24	-------	2	
		6016	−4.0	202.1	−22.0	48	-------	20	
		6016	+6.0	212.1	−20.0	436	-------	28	
		6019	+15.0	221.1	+25.0	24	-------	3	
		6014	+20.0	226.1	−7.0	73	-------	7	
		6012	+48.0	254.1	+4.0	170	-------	20	
		6011	+55.0	261.1	+21.0	12	-------	4	
		6005	+57.0	263.1	−10.0	36	-------	2	
		6000	+65.0	271.1	+19.0	12	-------	2	
		6013	+85.0	291.1	+7.0	194	1,374	2	
July 30	11 14	6022	−56.0	137.2	+19.0	6	-------	1	Do.
		6020	−1.0	192.2	+3.0	6	-------	3	
		6017	+8.0	201.2	−7.0	412	-------	21	
		6017	+15.0	208.2	−7.0	48	-------	28	
		6016	+7.0	200.2	−24.0	48	-------	27	
		6016	+18.0	211.2	−21.0	436	-------	22	
		6023	+21.0	214.2	+6.0	12	-------	2	
		6014	+33.0	226.2	−8.0	12	-------	1	
		6012	+60.0	253.2	+3.0	291	-------	17	
		6005	+69.0	262.2	−10.5	24	1,295	1	
July 31	12 34	6025	−80.0	99.2	−2.0	97	-------	3	Do.
		6024	−73.0	106.2	−12.0	121	-------	1	
		(*)	−63.0	116.2	−16.0	6	-------	1	
		6022	−41.0	138.2	+19.0	12	-------	2	
		6017	+22.0	201.2	−7.0	339	-------	40	
		6016	+30.0	209.2	−21.0	291	-------	30	
		6023	+33.0	212.2	+7.0	12	-------	4	
		6014	+47.0	226.2	−7.0	48	-------	1	
		6012	+75.0	254.2	+3.0	436	1,362	14	

Mean daily area for 31 days =2,937. * Not numbered.