SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING JUNE, 1931

By HERBERT H. KIMBALL, In Charge Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January, 1931, REVIEW, page 41.

Table 1 shows that solar radiation intensities averaged above the normal intensities for June at Washington and below the June normals at Madison and Lincoln.

Table 2 shows an excess in the total radiation received on a horizontal surface as compared with the normal amount for June at Washington and New York; close to normal at Lincoln, Gainesville, and La Jolla; and a deficiency at all other stations for which normals have been computed.

TABLE 1.—*Solar radiation intensities during June, 1931*

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

Washington, D. C.

Date	Sun's zenith distance										
	8a.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] 1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
June 2	6.50				1.06	1.42					7.29
June 3	9.47					1.17	0.80				7.29
June 4	10.59			0.68	0.92	1.19					11.38
June 9	8.81		0.69	0.82	1.00						9.14
June 12	11.81				0.99						11.81
June 17	9.83		0.70	0.95	1.15	1.28					8.18
June 18	10.59		0.69	0.84	1.02	1.24					8.48
June 19	13.13		0.62	0.74	0.95	1.26	0.94				16.79
June 20	16.20			0.85	0.94	1.19					14.60
June 25	14.10					1.26					10.97
June 29	10.59		0.74	0.96	1.12	1.32	1.04				9.83
June 30	13.61			0.90	1.10	1.29					13.61
Means			0.69	0.84	1.02	1.26	0.93				
Departures			+0.03	+0.07	+0.09	+0.03	+0.02				

Madison, Wis.

June 8	6.76	0.81	0.87	0.99	1.17	1.30					6.02
June 16	9.47				1.15						10.97
June 18	11.38					1.24					17.37
June 24	14.10					1.19					19.89
June 25	18.59			0.81	1.00	1.20					20.57
June 26	18.59					1.22					20.57
June 27	19.23					1.17					19.23
June 29	19.89	0.48	0.57	0.73	0.91	1.18					18.59
June 30	17.96		0.61	0.75	0.88	1.19					16.20
Means		(0.64)	0.68	0.82	1.02	1.21					
Departures		−0.04	−0.16	−0.13	−0.08	−0.11					

Lincoln, Nebr.

June 3	12.68						1.11	0.93	0.71		11.81
June 8	10.59		0.59	0.73	0.90	1.19					12.68
June 16	15.11				0.96		0.98	0.78			13.13
June 17	15.65		0.59	0.73	0.95	1.21	1.06	0.89	0.69		15.65
June 18	16.79		0.80	0.93	1.04	1.21	1.02	0.78			16.20
June 23	14.10						1.06	0.89	0.76		16.20
June 24	15.11				1.13	1.30					15.11
June 25	16.20				1.09	1.35					15.11
June 26	16.20		0.78	0.92	1.11	1.32	1.03	0.86	0.73		15.11
June 27	17.37					1.29	1.01	0.82	0.69		14.10
June 29	16.79		0.64	0.78	1.00	1.25					15.65
June 30	15.65		0.78	0.91	1.09	1.34					14.10
Means			0.70	0.83	1.03	1.27	1.04	0.85	0.72		
Departures			−0.06	−0.09	−0.06	−0.07	−0.05	−0.05	−0.07		

[1] Extrapolated.

Skylight polarization measurements obtained on five days at Madison give a mean of 54 per cent, with a maximum of 61 per cent on the 8th. At Washington, measurements obtained on three days give a mean of 59 per cent, with a maximum of 64 per cent on the 4th. These are above the corresponding June averages for Washington. At Madison the values are slightly below the corresponding averages.

TABLE 2.—*Total solar radiation (direct+diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Twin Falls	Pittsburgh	Gainesville	Fresno	La Jolla	Miami	New Orleans
	AVERAGE DAILY TOTALS											
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
June 4	501	391	463	294	333	626	411	[1] 606	600	389	655	510
June 11	475	539	559	423	371	659	500	457	707	422	532	384
June 18	574	467	605	442	480	626	495	506	693	462	556	244
June 25	630	582	618	440	509	716	394	453	761	466	654	283
	DEPARTURES FROM WEEKLY NORMALS											
June 4	+17	−118	−66	−116	−65	−8	−38	+40	−82	−36		
June 11	−24	+42	+20	+17	−29	−2	+13	−43	+11	+14		
June 18	+89	−52	+41	+28	+70	−75	+2	+37	−26	+17		
June 25	+106	+41	+29	+9	+90	+15	−92	−38	+35	−9		
Excess or deficiency since first of year on July 1, 1931	+1,461	−4,291	+434	−1,323	−217	+554	−1,128	−534	−315	−2,674		

[1] 5-day mean.

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, Yerkes, 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	
1931	*h*	*m*	°	°	°			
June 1 (Mount Wilson)	10	40	−57.0	106.5	+6.0		314	
			−51.0	112.5	+8.0	5		
			+30.0	193.5	−9.0		6	325
June 2 (Naval Observatory)	10	59	−40.0	110.2	+5.0		154	
			+40.0	190.2	−6.0		31	185
June 3 (Naval Observatory)	11	7	−26.0	110.9	+5.0		201	
			−20.5	116.4	−8.0	6		
			+56.0	192.9	−7.0		15	222
June 4 (Naval Observatory)	10	56	−12.5	111.2	+5.0		216	216
June 5 (Naval Observatory)	11	42	+2.5	112.6	+6.0		278	278
June 6 (Naval Observatory)	10	58	+16.0	113.3	+6.0		278	278
June 7 (Naval Observatory)	10	43	−20.0	64.2	−9.5	3		
			+31.0	115.2	+5.5		355	358
June 8 (Naval Observatory)	11	7	+17.0	117.7	+5.0		185	185
June 9 (Naval Observatory)	11	42	+17.0	74.1	+10.5		46	
			+54.0	111.1	+4.5		93	
			+70.0	127.1	+6.0		62	201
June 10 (Mount Wilson)	13	15	+20.0	63.1	−10.0	1		
			+31.0	74.1	+11.0		28	
			+70.0	113.1	+5.0		58	
			+85.0	128.1	+6.0	29		116
June 11 (Naval Observatory)	10	36	+43.0	74.3	+12.0		31	
			+80.0	111.3	+4.0	31		62
June 12 (Naval Observatory)	11	1	+55.0	72.8	+13.5	6		6
June 13 (Naval Observatory)	11	52	+8.5	12.6	−3.5		46	46
June 14 (Mount Wilson)	11	30	+78.0	69.0	−8.0		42	42
June 15 (Naval Observatory)	13	10	No spots.					
June 16 (Naval Observatory)	11	44	No spots.					
June 17 (Mount Wilson)	17	15	+26.0	334.2	−12.0	4		4
June 18 (Mount Wilson)	9	10	+35.0	334.4	−12.0	4		4
June 19 (Naval Observatory)	10	54	+2.5	287.7	−0.5		15	15
June 20 (Naval Observatory)	10	38	No spots.					
June 21 (Naval Observatory)	10	51	No spots.					
June 22 (Naval Observatory)	11	27	No spots.					
June 23 (Naval Observatory)	10	59	No spots.					
June 24 (Naval Observatory)	10	42	No spots.					
June 25 (Naval Observatory)	10	47	+2.0	207.9	−1.5		31	31
June 26 (Mount Wilson)	18	15	−65.0	123.5	+3.0	7		7
June 27 (Naval Observatory)	10	47	−30.0	149.4	−2.5	9		9
June 28 (Naval Observatory)	10	55	−18.0	148.1	−2.5	12		12
June 29 (Naval Observatory)	11	3	−75.0	77.8	+6.0		123	
			−72.0	80.8	−10.0		62	185
June 30 (Naval Observatory)	10	54	−62.5	77.1	+6.0		108	
			−59.0	80.6	−9.5	62		170
Mean daily area for June								99