SOLAR AND SKY RADIATION MEASUREMENTS DURING JULY, 1919.

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[Dated Solar Radiation Investigations Section, Washington, Aug. 30, 1919.]

For a description of instrumental exposures, and an account of the methods of obtaining and reducing the measurements, the reader is referred to the REVIEW for January, 1919, **47**:4.

The monthly means and departures from normal in Table 1 show that the radiation measurements averaged below the July normal at Washington and Lincoln, and very close to normal at Madison and Santa Fe. At Madison a noon reading of 1.46 calories per square centimeter per minute, measured on the 10th, is the highest intensity ever measured at that station in July.

Table 3 shows a deficiency of 12 per cent for Washington and an excess of 7 per cent for Lincoln in the total radiation for the month as compared with the normal amounts for July. The total for Madison is close to normal.

The skylight polarization measurements made at Washington on 7 days give a mean of 46 per cent, with a maximum of 59 per cent on the 3d. At Madison, measurements made on 12 days give a mean of 56 per cent, with a maximum of 68 per cent on the 10th. These are average values for July.

TABLE 1.—*Solar radiation intensities during July, 1919.*

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

WASHINGTON, D. C.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
July 1			0.82		0.75	0.68				
2	1.11	1.10	1.00	0.92	0.82	0.75				
3	0.99	1.03	0.93	0.84	0.74	0.66	0.59			
5	1.01	0.87								
8	1.33	1.14	0.97	0.81						
11	1.27	1.15	0.88	0.79	0.71	0.64				
24	0.90	0.73	0.60							
25	1.07	0.91	0.61							
26	0.92		0.49							
28	1.29									
29	1.26									
30	1.22	1.04	0.89	0.78						
Monthly means	**1.12**	**1.00**	**0.80**	**0.83**	**0.76**	**0.68**	**(0.59)**			
Departure from 11-year normal	**−0.10**	**−0.09**	**−0.14**	**−0.05**	**−0.07**	**−0.05**	**−0.09**			
P. M.										
July 2		1.01	0.87		0.80	0.77				
3		0.66								
8		1.22	1.09	0.83	0.75	0.68				
11		1.10								
25		0.73	0.61	0.53	0.45	0.39	0.33	0.28	0.24	
29		1.13	1.00							
Monthly means		**0.98**	**0.89**	**(0.68)**	**0.67**	**0.61**	**(0.33)**	**(0.28)**	**(0.24)**	
Departure from 11-year normal		**−0.06**	**−0.10**	**−0.18**	**−0.11**	**−0.11**	**−0.34**			

TABLE I.—*Solar radiation intensities during July, 1919*—Continued.

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

MADISON, WIS.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
July 1		0.79			0.44		0.33	0.29		
3		1.01		0.77	0.68					
7	1.35	1.24	1.12	1.04	0.97	0.89				
9		1.04	0.96	0.84						
10	1.47	1.31	1.20	1.14	1.07	0.99	0.92	0.86	0.82	0.78
11			0.99	0.87	0.77	0.69	0.67	0.62		
15	1.38	1.25	1.18	1.09	1.01					
16	1.43	1.31	1.21	1.13	1.06	0.99	0.94	0.88	0.84	0.80
17	1.37	1.25	1.12	1.04	0.98	0.92	0.86	0.81	0.77	0.74
18	1.15	0.92	0.73	0.61	0.50	0.42	0.37	0.33	0.31	0.29
19	1.14	0.97	0.85		0.71	0.66	0.59			0.40
20	1.11									
22	1.29	1.23	1.13	1.06	1.01	0.95	0.89	0.84		0.77
23	1.14	0.96	0.87	0.78	0.71	0.65	0.59		0.47	0.42
24	1.03									
25			0.70							
28					0.80					0.51
29	1.25									
30	1.02									
Monthly means	**1.24**	**1.11**	**1.00**	**0.94**	**0.82**	**0.80**	**0.68**	**0.66**	**0.64**	**0.59**
Departure from 10-year normal	**−0.01**	**±0.00**	**−0.01**	**−0.01**	**−0.06**	**−0.06**	**−0.09**	**−0.04**		
P. M.										
July 7		1.15	0.87							
10		1.32	1.22	1.13						
15		1.28	1.18	1.09	1.01					
16		1.23	1.12	1.00						
17		1.11	0.97	0.87						
18		0.88								
22		1.09	0.92							
29		0.97	0.85							
Monthly means		**1.13**	**1.02**	**1.02**	**(1.01)**					
Departure from 10-year normal		**+0.01**	**+0.05**	**+0.08**	**+0.10**					

TABLE 1.—Lincoln, Nebr.

A. M.										
July 2		1.06	0.91	0.82						
3		1.18	1.06	0.96	0.87	0.80				
9	1.34	1.22	1.11	1.02	0.93	0.85				
18		1.15	1.01	0.93	0.88					
22			1.13	0.99	0.95	0.87	0.78			
23		0.92	0.80	0.70	0.61					
24		1.00	0.88	0.76	0.68	0.60				
25					0.59	0.51				
26	1.30	1.18	1.07	0.99	0.91	0.85	0.79	0.74		
30	1.33	1.22	1.13	1.02						
Monthly means	**1.32**	**1.12**	**1.01**	**0.91**	**0.80**	**0.75**	**(0.78)**	**(0.74)**		
Departure from 5-year normal	**−0.02**	**−0.06**	**−0.07**	**−0.08**	**−0.09**	**−0.08**	**−0.03**	**−0.09**		
P. M.										
July 7		1.19	1.06	0.98	0.90	0.82	0.76	0.71		
9		1.20								
10		1.10	0.97	0.86	0.79	0.72	0.66	0.61		
11		1.11	1.02	0.94	0.87	0.80	0.73	0.67		
21		1.14	1.09	0.99	0.84	0.75	0.69	0.64		
22		1.01	0.88	0.74	0.58	0.47	0.40	0.30		
23		0.89	0.77	0.66	0.57	0.49	0.43			
24		0.96								
26		1.15	1.04	0.95	0.87	0.81	0.76			
Monthly means		**1.08**	**0.98**	**0.87**	**0.77**	**0.69**	**0.63**	**0.59**		
Departure from 5-year normal		**−0.09**	**−0.08**	**−0.09**	**−0.11**	**−0.11**	**−0.10**	**−0.04**		

TABLE 1.—*Solar radiation intensities during July, 1919*—Continued.

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

TABLE 1.—Sante Fe, N. Mex.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
July 7	.....	.....	.....	1.17	1.10	1.02	.....	.....	.....	.....
10	1.40	1.30	.....	.....	1.08	0.99	.....	.....	.....	.....
11	.....	.....	.....	1.06	1.01	0.94	0.88	.....	.....	.....
23	1.43	.....	.....	.....	.....	.....	.....	.....	.....	.....
26	.....	.....	.....	1.11	1.05	0.99	.....	.....	.....	.....
Monthly means	(1.42)	(1.30)	.....	1.11	1.06	0.98	(0.88)	.....	.....	.....
Departures from 7-year normal	±0.00	±0.00	.....	−0.04	−0.02	−0.04	−0.07	.....	.....	.....
P. M.										
July 22	.....	.....	1.16	1.08	1.04	1.01	.....	.....	.....	.....
23	.....	1.29	1.17	1.07	0.99	0.92	.....	.....	.....	.....
24	.....	.....	1.14	1.07	0.97	0.93	.....	.....	.....	.....
Monthly means	.....	(1.29)	1.16	1.07	1.00	0.95	.....	.....	.....	.....
Departure from 3-year normal	.....	+0.01	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 2.—*Vapor pressures at pyrheliometric stations on days when solar radiation intensities were measured.*

Washington, D. C.			Madison, Wis.			Lincoln, Nebr.			Santa Fe, N. Mex.		
Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.
1919.	*mm.*	*mm.*	1919.	*mm.*	*mm.*	1919.	*mm.*	*mm.*	1919.	*mm.*	*mm*
July 1	10.59	15.11	July 1	12.24	16.79	July 2	17.96	17.96	July 7	7.87	10.21
2	14.10	17.37	3	16.79	17.96	3	17.96	16.79	10	9.47	8.18
3	16.20	20.57	7	11.38	9.83	7	17.96	14.60	11	10.59	8.48
5	17.96	18.59	9	15.11	14.60	9	18.59	16.20	22	8.48	5.79
8	10.21	12.24	10	10.97	9.47	10	17.37	17.37	23	8.48	5.79
11	13.13	10.59	11	9.83	15.65	11	19.23	13.13	24	7.87	7.29
24	17.37	21.28	15	13.13	11.81	18	12.68	10.59	26	7.87	7.29
25	16.79	14.60	16	10.59	10.59	21	12.68	8.81			
26	16.20	21.28	17	11.81	10.97	22	9.83	8.18			
28	19.23	19.23	18	13.13	12.24	23	10.59	9.47			
29	19.23	12.24	19	14.10	11.81	24	9.83	11.38			
30	10.21	14.10	20	14.10	11.38	25	14.60	12.68			
			22	12.24	10.97	26	14.10	12.68			
			23	10.21	11.81	30	17.37	13.61			
			24	13.13	10.97						
			25	10.59	12.68						
			28	14.10	13.13						
			29	12.24	13.13						
			30	13.61	16.79						

TABLE 3.—*Daily totals and departures of solar and sky radiation during July, 1919.*

[Gram-calories per square centimeter of horizontal surface.]

Day of month.	Daily totals.			Departures from normal.			Excess or deficiency since first of month.		
	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.	Wash. ington.	Madison.	Lincoln.
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
1	638	532	699	119	− 10	105	119	− 10	105
2	667	533	681	150	− 9	89	269	− 19	194
3	605	586	708	90	45	118	359	26	312
4	571	340	389	57	−201	−200	416	− 175	112
5	604	191	391	92	−349	−196	508	− 524	−84
6	430	651	702	− 80	112	116	428	− 412	32
7	365	690	707	−143	151	122	285	− 261	154
8	704	334	592	198	−204	7	483	− 465	161
9	466	251	695	− 38	−286	110	445	− 751	271
10	230	730	730	−272	194	146	173	− 557	417
11	685	648	609	186	113	25	359	− 444	442
12	561	638	627	64	104	43	423	− 340	485
13	353	350	640	−142	−183	57	281	− 523	542
14	393	342	489	−100	−190	− 94	181	− 713	448
15	212	681	551	−279	150	− 32	− 98	− 563	416
16	153	647	598	−337	119	16	− 435	− 444	432
17	241	661	479	−248	137	−101	− 683	− 307	331
18	202	602	670	−286	81	91	− 969	− 226	422
19	292	576	404	−195	59	− 173	−1,164	− 167	249
20	274	607	638	−212	93	62	−1,376	− 74	311
Decade departure.	.....	.....	.....	.....	.....	.....	−1,549	483	− 106

TABLE 3.—*Daily totals and departures of solar and sky radiation during July, 1919*—Continued.

Day of month.	Daily totals.			Departures from normal.			Excess or deficiency since first of month.		
	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.
	Cals.	*Cals.*	*Cals.*	*Cals.*	*Cals.*	*Cals.*	*Cals.*	*Cals.*	*Cals.*
21	293	502	749	−192	− 8	175	−1,568	− 82	486
22	245	627	728	−239	120	156	−1,807	38	642
23	335	563	681	−148	60	111	−1,955	98	753
24	543	587	672	61	87	104	−1,894	185	857
25	641	464	638	160	− 32	72	−1,734	153	929
26	518	550	694	38	57	130	−1,696	210	1,059
27	625	504	652	145	14	90	−1,551	224	1,149
28	543	435	688	64	− 53	129	−1,487	171	1,278
29	571	491	672	92	6	115	−1,395	177	1,393
30	595	481	648	117	− 1	94	−1,278	176	1,487
31	178	220	292	−300	−259	−260	−1,578	− 83	1,227
Decade departure.	.....	.....	.....	.....	.....	.....	− 202	− 9	916
Excess or deficiency since first of year: gr.—cal.	.....	.....	.....	.....	.....	.....	−4,420	−4,949	−2,718
Excess or deficiency since first of year: per cent.	.....	.....	.....	.....	.....	.....	− 5.5	− 6.2	− 3.0

MEASUREMENTS OF THE SOLAR CONSTANT OF RADIATION AT CALAMA, CHILE, MAY, 1919.

By C. G. ABBOT, Director.

[Dated Astrophysical Observatory, Smithsonian Institution, Washington, Sept. 2, 1919.]

In continuation of the publications begun in February, 1919, I give herewith the values of the solar constant of radiation obtained at Calama, Chile, for the month of May, 1919.

The table is in the usual form, and explanation of the symbols and arrangement of the table will be found by the reader in the MONTHLY WEATHER REVIEW for February, 1919.

Date.	Solar Constant.	Grade.	Transmission coefficient at 0.5 micron.	Humidity air mass 3.			Remarks.
				ρ/ρ_{sc}	V. P.	Rel. hum.	
A. M.	*cal.*				*cm.*	%	
May 1	1.952	E−	0.872	0.653	0.16	20	
2	1.952	E−	.879	.637	.14	16	
3	1.893	VG+	.873	.636	.14	16	
4	1.958	E	.881	.680	.14	16	
5	1.954	E−	.878	.712	.11	13	Distant cirri in north.
6	1.955	E−	.872	.607	.12	14	Cirri in east, north, and west.
7	1.956	E	.875	.587	.11	13	Cirri scattered about sky moving northeast.
8	1.964	VG+	.866	.596	.14	14	Thin cirri scattered about sky.
9	1.924	VG+	.878	.596	.14	15	
10	1.937	E−	.870	.543	.17	20	
11	1.983	E−	.852	.482	.24	29	
12	1.924	E	.864	.456	.31	34	
13	1.901	G+	.862	.436	.33	43	
14	1.939	G	.853	.379	.38	46	Cirri in west.
15	1.895	E−	.873	.439	.24	28	Cirri scattered about east, south, and west.
16	1.884	VG−	.888	.518	.20	18	Cirri scattered over sky.
P. M.							
18	1.903	E−	.876	.532	.27	17	
A. M.							
19	1.927	VG+	.881	.506	.21	26	
20	1.936	VG+	.880	.531	.17	22	
21	1.931	VG+	.872	.578	.19	23	
22	1.913	VG+	.880	.594	.12	13	Cirri coming from southwest.
23	1.966	E−	.870	.587	.15	16	Thin cirri scattered about sky.
24	1.915	E−	.870	.582	.14	15	Some cirri in west.
28	1.940	VG+	.870	.734	.09	13	
P. M.							
29	1.931	VG+	.874	.664	.19	13	
A. M.							
30	1.975	E	.876	.718	.09	14	
31	1.956	E−	.870	.712	.07	12	