SOLAR AND SKY RADIATION MEASUREMENTS DURING APRIL, 1919.

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[Dated: Solar Radiation Investigations Section, Washington, May 28, 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 obtained averaged slightly above the normal. On account of the unusual amount of cloudiness, however, but few measurements were made at any of the stations.

With the return of Assistant Observer E. L. Hardy from military service to Santa Fe, radiation measurements were resumed at that station at the end of the month.

Table 3 shows a normal amount of radiation for April at Washington, but deficiencies of 18 and 16 per cent, respectively, at Madison and Lincoln. Most of the deficiency at Lincoln occurred during the third decade.

An error in computing the Madison normals for the last decade of March, 1919, made the deficiency for that month appear to be 980 instead of 764 calories and the deficiency since the first of the year 2,344 instead of 2,128 calories. This latter value has been used in determining the deficiency up to the end of April.

Skylight polarization measurements obtained on five days at Washington give a mean of 56 per cent, with a maximum of 64 per cent on the 19th. These are average values for Washington in April. At Madison, measurements obtained on three days give a mean of 60 per cent, with a maximum of 66 per cent on the 26th.

TABLE 1.—*Solar radiation intensities during April, 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.*
Apr. 2			0.91							
3	1.24	1.18	1.13							
8			0.78	0.73	0.69	0.66	0.60			
9			0.95	0.80	0.66	0.54				
12		1.31								
19	1.45	1.37	1.24	1.12	1.03	0.96	0.89	0.83	0.78	0.73
21				0.91	0.85	0.79				
22						0.89	0.84	0.79	0.76	0.72
23		1.06	0.89	0.75	0.63	0.53				
24			1.25							
25	1.37									
Monthly means	**1.35**	**1.20**	**1.02**	**0.86**	**0.77**	**0.73**	**0.78**	**(0.81)**	**(0.77)**	**(0.72)**
Departure from 11-year normal	**−0.02**	**+0.03**	**−0.03**	**−0.08**	**−0.09**	**−0.06**	**+0.05**	**+0.08**	**+0.09**	**+0.05**
P. M.										
Apr. 19		1.31	1.12	1.05	0.97	0.90	0.85	0.79	0.71	0.67
21		1.42	1.24	1.13	1.05	0.94	0.88	0.81	0.75	0.70
Monthly means		**(1.36)**	**(1.18)**	**(1.09)**	**(1.01)**	**(0.92)**	**(0.86)**	**(0.80)**	**(0.73)**	**(0.68)**
Departure from 11-year normal		**+0.14**	**+0.10**	**+0.09**	**+0.10**	**+0.07**	**+0.08**	**+0.14**	**+0.13**	**±0.00**

TABLE 1.—*Solar radiation intensities during April, 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.*
Apr. 1			1.30							
25	1.54	1.44	1.35	1.26	1.18	1.15	1.06	0.99	0.93	
26	1.55	1.45	1.38	1.30	1.22	1.15	1.10	1.04	0.99	
Monthly means	**(1.54)**	**(1.44)**	**1.34**	**(1.28)**	**(1.20)**	**(1.15)**	**(1.08)**	**(1.02)**	**(0.96)**	
Departure from 9-year normal	**+0.14**	**+0.10**	**+0.11**	**+0.14**	**+0.10**	**+0.04**	**+0.03**	**+0.03**	**+0.02**	
P. M.										
Apr. 22		1.10								
25		1.40	1.24	1.16	1.05	0.95	0.86	0.77	0.70	
26		1.39								
Monthly means		**1.30**	**(1.24)**	**(1.16)**	**(1.05)**	**(0.95)**	**(0.86)**	**(0.77)**	**(0.70)**	
Departure from 9-year normal		**−0.06**	**−0.03**	**−0.02**	**−0.04**	**−0.10**	**−0.06**			

Lincoln, Nebr.

A. M.										
Apr. 1		1.26								
11		1.29								
12		1.34	1.18							
16		1.34	1.24	1.15	1.07					
17	1.53	1.43	1.34	1.25	1.16	1.14				
Monthly means	**(1.53)**	**1.33**	**1.25**	**(1.20)**	**(1.12)**	**(1.14)**				
Departures from 4-year normal	**+0.03**	**−0.02**	**+0.01**	**+0.07**	**+0.09**	**+0.20**				
P. M.										
Apr. 12		1.34	1.21	1.14	1.05	0.96	0.88	0.80	0.72	
17		1.42	1.31	1.20	1.10	1.00				
Monthly means		**(1.38)**	**(1.26)**	**(1.17)**	**(1.08)**	**(0.98)**	**(0.88)**	**(0.80)**	**(0.72)**	
Departures from 4-year normal		**+0.06**	**+0.08**	**+0.09**	**+0.08**	**+0.07**	**+0.02**	**−0.03**	**−0.03**	

Santa Fe, N. Mex.

A. M.										
Apr. 30	1.46	1.38	1.31	1.20	1.10	1.01				
P. M.										
Apr. 23			1.25							

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.		
Dates.	8a.m.	8p.m.	Dates.	8a.m.	8p.m.	Dates.	8a.m.	8p.m.	Dates.	8a.m.	8p.m.
1919.	*mm.*	*mm.*	1919.	*mm.*	*mm.*	1919.	*mm.*	*mm.*	1919.	*mm.*	*mm.*
Apr. 2	1.88	2.87	Apr. 1	2.26	2.36	Apr. 1	3.99	4.57	Apr. 23	5.16	7.57
3	3.00	3.99	22	6.76	7.29	11	4.17	5.36	30	5.16	4.17
8	9.47	8.18	25	2.16	3.60	12	5.79	5.79			
9	8.81	8.81	26	2.26	3.45	16	4.17	3.99			
12	8.81	7.29				17	3.99	2.74			
19	4.17	4.57									
21	6.76	3.99									
22	4.75	5.16									
23	6.27	7.87									
24	11.81	3.15									
25	2.36	2.26									

TABLE 3.—*Daily totals and departures of solar and sky radiation during April, 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.	Washington.	Madison.	Lincoln.
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 1	340	554	319	− 35	174	−106	− 35	174	− 106
2	380	299	429	3	− 83	5	− 32	91	− 101
3	510	86	176	130	−298	−247	98	− 207	− 348
4	167	235	586	−215	−151	164	− 117	− 358	− 184
5	289	290	462	− 96	− 98	41	− 213	− 456	− 143
6	502	401	329	115	11	− 91	− 98	− 445	− 234
7	356	110	530	− 34	−281	111	− 132	− 726	− 123
8	430	501	356	38	108	− 62	− 94	− 618	− 185
9	516	117	69	121	−277	−348	27	− 895	− 533
10	368	169	288	− 29	−227	−128	− 2	−1,122	− 661
11	81	148	524	−319	−249	109	− 321	−1,371	− 552
12	414	126	643	12	−273	229	− 309	−1,644	− 323
13	472	524	166	67	124	−247	− 242	−1,520	− 570
14	273	93	125	−134	−309	−287	− 376	−1,829	− 857
15	214	48	128	−196	−356	−283	− 572	−2,185	−1,140
16	102	85	492	−311	−322	79	− 883	−2,507	−1,061
17	156	416	729	−260	6	314	−1,143	−2,501	− 747
18	313	580	619	−106	169	202	−1,249	−2,335	− 545
19	655	402	354	233	− 15	− 65	−1,016	−2,350	− 610
20	500	616	661	75	196	240	− 941	−2,154	− 370
Decade departure							− 939	−1,032	291
21	623	607	181	194	184	−242	− 747	−1,970	− 612
22	592	403	548	160	36	123	− 587	−1,931	− 489
23	589	403	409	154	− 27	− 18	− 433	−1,961	− 507
24	480	448	321	42	15	−108	− 391	−1,946	− 615
25	565	694	564	124	258	133	− 267	−1,688	− 482
26	468	681	143	24	243	−292	− 243	−1,445	− 774
27	694	87	138	246	−353	−301	− 3	−1,798	−1,075
28	278	384	113	−173	− 59	−330	− 170	−1,857	−1,405
29	586	380	64	132	− 65	−383	− 38	−1,922	−1,788
30	468	95	213	11	−352	−238	− 27	−2,274	−2,026
Decade departure							− 914	− 120	−1,656
Excess or deficiency since first of year. gr.-cal							− 539	−4,402	−3,375
Excess or deficiency since first of year. per cent							− 1.6	− 12.9	− 8.6

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

By Dr. C. G. ABBOT.

Dated: Astrophysical Observatory, Smithsonian Institution, Washington, May 28, 1919.]

In continuation of the publication begun in February, I communicate the following results of the measurements of the solar constant of radiation which were made by the Smithsonian observers, Messrs, A. F. Moore and L. H. Abbot, at Calama, Chile, in the month of March, 1919.

The arrangement of the observations in the table is the same as that employed in the preceding communications, and is fully explained in the MONTHLY WEATHER REVIEW for February, 1919.

TABLE 1.—*Measurements of the solar constant of radiation at Calama, Chile.*

Date.	Solar Const.	Grade.	Transmission coefficient at 0.5 microns.	Humidity air mass 3.			Remarks.
				ρ/ρ_{sa}	V. P.	Rel. Hum.	
	cal.				*cm.*	%	
A. M. Mar. 1	1.952	VG−	0.771	0.253	0.75	60	Considerable cirri in north and east.
P. M. Mar. 3	1.949	VG	.848	.367	.58	29	Considerable cirri and cumuli in east, with line of small cirrocumuli low in west.
5	2.015	G−	.840	.400	.48	21	Considerable cirri in east, north, south and low in west.
6	1.931	E−	.856	.473	.36	16	Cumuli low in east and cirri in south and west.
A. M. Mar. 9	1.938	G	.828	.360	.24	22	Cirri spread over most of sky.
10	1.916	VG−	.844	.414	.29	26	Some cirri around horizon in north and east with large patch just below sun.
P. M. Mar. 13	1.981	P+	.845	.397	.44	22	Considerable cirri in east. More coming in northwest.
A. M. Mar. 17	1.905	VG−	.837	.352	.53	49	
18	1.949	VG−	.851	.457	.35	35	
19	1.934	VG+	.855	.406	.37	35	
21	1.891	VG+	.852	.356	.49	56	
25	1.942	VG	.849	.368	.37	31	Cirri scattered over large part of east and west.
26	1.938	E−	.868	.508	.29	23	Cloudless except distant cirri in northeast.
28	1.955	VG+	.861	.500	.31	29	Considerable cirri in west.
30	1.942	VG+	.843	.335	.46	46	Considerable cirrocumuli in west and south. Small patches also in east.
31	1.913	VG+	.844	.325	.52	50	