TABLE 1.—*Solar radiation intensities during April, 1920*—Continued.

Date.	Sun's zenith distance. 8 a.m.	77.8°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	77.8°	Noon
	75th meridian time.	Air mass. A. m.					P. m.				Local mean solar time.
	e.	5.0	4.0	3.0	2.0	1.0*	2.0	3.0	4.0	5.0	e.
WASHINGTON, D. C.											
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.
Apr. 3	3.30		1.02	1.15	1.30	1.49					2.74
6	1.78				1.20						1.96
10	2.26					1.43					2.49
13	5.16				1.07						3.15
21	9.47					1.44	1.29	1.03			10.59
22	7.29		0.76	0.91							5.79
29	6.76			0.99	1.18	1.41	1.17				4.17
Means			(0.89)	1.02	1.19	1.44	(1.23)	(1.03)			
Departures			+0.14	+0.15	+0.13	+0.06	+0.14	+0.11			
MADISON, WIS.											
Apr. 3	1.24				1.29						2.26
8	1.78				1.22	1.42					2.16
9	2.62				1.25						2.87
13	1.96				1.31	1.50					3.15
14	2.49				1.24						2.49
17	3.99				1.15						4.37
24	4.17					1.45	0.98				5.16
Means					1.24	1.46	(0.98)				
Departures					±0.00	+0.06	−0.27				
LINCOLN, NEBR.											
Apr. 2			1.09	1.23	1.40						
9			0.61	0.79	1.01						
13			0.76	0.88	1.08						
20			0.81	0.93	1.14	1.40					
21				0.93	1.15	1.44	1.06	0.84	0.60	0.46	
27			0.95	1.08	1.30	1.59					
28				0.95	1.24	1.50					
Means			0.84	0.97	1.19	1.49	(1.06)	(0.84)	(0.60)	(0.46)	
Departures			+0.01	−0.04	−0.04	±0.00	−0.10	−0.14	−0.23	−0.25	

* Extrapolated.

Table 2 gives the average daily solar and sky radiation received on a horizontal surface for each weekly period from January 1 to April 29, 1920, inclusive. The period from February 26 to March 4 in 1920 contains 8 days. The weekly means of the departures of the daily values from normal values, and also the excess or deficiency of radiation since the first of the year, are also given. All three stations show a marked deficiency of radiation from about January 15 to February 25, and an excess during the first half of April.

During the months January to April, 1920, fewer skylight polarization measurements than usual were obtained at Washington and Madison, as the ground was frequently entirely or partly covered with snow. The measurements show about the average percentage of polarized light.

TABLE 2.

Week beginning—	Average daily radiation. Washington.	Madison.	Lincoln.	Average daily departure for the week. Washington.	Madison.	Lincoln.	Excess or deficiency since first of year. Washington.	Madison.	Lincoln.
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Jan. 1	189	156	134	27	11	− 54	188	80	− 375
8	156	184	209	− 11	29	7	109	281	− 326
15	135	154	219	− 41	−18	0	− 176	158	− 323
22	113	179	200	− 77	−13	− 35	− 717	66	− 571
29	189	176	107	− 17	−32	−145	− 839	− 160	−1,584
Feb. 5	197	156	235	− 30	−70	− 34	−1,051	− 648	−1,820
12	276	249	334	26	2	44	− 871	− 631	−1,513
19	187	251	153	− 82	−15	−161	−1,446	− 735	−2,638
26	355	307	387	66	15	44	− 922	− 618	−2,287
Mar. 5	340	372	419	29	52	44	− 720	− 256	−1,976
12	314	341	427	− 20	1	26	− 860	− 249	−1,794
19	410	276	396	61	−82	− 20	− 433	− 820	−1,933
26	363	342	450	− 4	−30	31	− 460	−1,028	−1,715
Apr. 2	397	468	488	10	82	73	− 393	− 455	−1,204
9	594	422	443	189	25	40	932	− 281	− 924
16	382	336	248	− 45	−78	−161	619	− 829	−2,053
23	436	343	391	13	−93	− 40	526	−1,476	−2,336

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

By C. G. ABBOT, Assistant Secretary.

[Smithsonian Institution, Washington, May 19, 1920.]

In continuation of preceding publications, I give in the following table the results obtained at Calama, Chile, in March, 1920, for the solar constant of radiation. The reader is referred to this REVIEW for February (pp. 85–87), August (pp. 580–582), and September (pp. 658–659), 1919, for statements of the arrangement and meaning of the table.

During the month of March only three days were lost to observation. This is very fortunate, for the month has been extremely interesting, owing to the remarkable solar phenomena centering about March 22. As shown in the following table of five-day mean values of the solar constant of radiation for the period beginning June 1, 1919, the broad features of the march of solar radiation values have been unusually interesting. In each month I have indicated the successive five-day periods by the capital letters A, B, C, D, E, and F. The last pentad includes all the days from the 26th to the end of the month. The values given are the number of thousandths of a calorie by which the solar radiation of a given time interval exceeds 1.900. Thus, for the first period of June the mean value is 1.946.

Approximate five-day mean solar-radiation observations.

	A.	B.	C.	D.	E.	F.[1]
1919.						
June	46	84	37	39	71	53
July	36	54	47	63	57	31
August	53	54	38	36	51	45
September	28	33	30	42	31	30
October	[2] 18	[3] 57	49	46	59	62
November	60	51	60	43	47	54
December	55	48	54	60	67	81
1920.						
January	69	102(?)	74	78	81	70
February		87	60	78	77	68
March	77	65	70	50	10	59

[1] Means for all the days from the 26th to the end of the month.
[2] Means for the 2d and 7th.
[3] Mean for the 8th, 9th, and 10th.

Up until the 7th of October there was, on the whole, a steady decline which had at last brought the observed values below the value 1.933 calories per square centimeter per minute representing the mean of the observations from 1903 to 1912, published in Volume III of the Annals of the Astrophysical Observatory. The concluding value of this series, taken October 7, is very strong since it depends upon a mean of four well-agreeing observations—three by the new method and one by the old. That value was 1.891. The value for the next following day, October 8, the mean of three well-agreeing observations by the new method, is 1.963. From this time until the middle of December, the values continued at the high average of 1.954. Then occurred a further rise to abnormally high averages; and for almost three months, from December 22 to March 17, the average value was about 1.976. There has not been so long-continued a period of high values during the time when the solar constant has been observed by the Smithsonian Institution, from 1905 until now.

Then occurred the remarkable, well-delineated large depression shown by the following values and having its minimum on March 23, only a few hours after the maximum activity of the sun, revealed by the great sun spots, aurorae, and the terrestrial magnetic disturbances of March 22 and 23. It is interesting to state in anticipation that with the recurrence of this disturbed solar region to a central position on the sun's disk on April 15 to 18 a similar though less deep depression of solar radiation values occurred.

Solar radiation observations of March, 1920.

Date	11–17[1]	18	19	20	21	22	23	24	26	27	28	29	30	31
Value	1.968	1.954	1.940	1.931	1.941	1.927	1.866	1.905	1.953	1.966	1.958	1.969	1.951	1.957

[1] Mean.

An interesting feature of the march of observations is the long series of values obtained on March 11 covering the entire available part of the day and including 2 solar constant values by the old method and 20 by the new. The results are given in the following table:

Observations of Mar. 11, 1920.

Time	......	7:16	7:36	8:03	8:55	9:20	9:50	10:20	10:50	11:20	11:50
Method	E_0	M_3	$M_{2.5}$	M_2	$M_{1.5}$	$M_{1.4}$	$M_{1.24}$	$M_{1.16}$	$M_{1.10}$	$M_{1.07}$	$M_{1.06}$
Value	1.961	1.985	1.997	1.976	1.981	1.961	1.948	1.956	1.952	1.949	1.957
Grade	E−	S	S	S	S	S	S	S	S	S	S
Time	12:20	12:50	1:20	1:50	2:20	2:50	3:05	3:54	4:22	4:40	
Method	$M_{1.06}$	$M_{1.08}$	$M_{1.12}$	$M_{1.19}$	$M_{1.29}$	$M_{1.43}$	$M_{1.5}$	M_2	$M_{2.5}$	M_3	E_0
Value	1.955	1.962	1.958	1.964	1.972	1.971	1.970	1.967	1.983	1.973	1.954
Grade	S	S	S	S	S	S	S	S	S	S	E−

Another similar series was taken on March 29, but the computations have not yet been completed. The observations of March 11 seem to follow a very smooth and definite course of variation, as if the intensity of sun rays were rather rapidly diminishing during the morning hours and more slowly recovering through the afternoon. As would be the case if this apparent change were real, the two values obtained by the old method are slightly below the values obtained by the new. It is, however, too early to suppose that all the sources of error are so minimized that this small change in one day is a really solar phenomenon. It may be possible that difference in the inclination of the pyrheliometer, or some other instrumental error, may have tended to produce this depression toward the noon hours. Further experiments are intended.

On the whole, the month of March has been far more cloudless than preceding months, and it is hoped that better weather conditions will now persist.

Date.	Solar constant.	Method.	Grade.	Transmission coefficient at 0.5 micron.	Humidity.			Remarks.
					ρ/ρ sc.	V. P.	Relative humidity.	
1920	*cal.*					*cm.*	%	
P. M. Mar. 1	1.980	$M_{1.25}$	S−	0.822	0.399	0.88	44	Cirri in south and west. Cirro-cumuli in north and east.
A. M. 2	2.002	M_2	S	.824	.295	.73	49	Some very thin cirri low in east and some in west.
	9.997	$M_{1.5}$						
	2.000	W.M.						
3	1.968	M_3	S−	.814	.206	.86	73	Some cirri in distant east and north.
	1.984	M_2						
	1.981	$M_{1.5}$						
	1.980	W.M.						
P. M. 5	1.949	$M_{1.36}$	S−	.835	.399	.86	46	Cumuli scattered over most of sky.
A. M. 6	1.973	$M_{1.28}$	U+	.828	.407	.86	65	Considerable cumuli, especially in east.
7	1.971	$M_{1.14}$	S−	.837	.439	.95	70	Cumuli scattered about most of sky, especially in east.
8	1.956	$M_{1.20}$	S−	.831	.410	.84	59	Cumuli scattered about sky.
10	1.958	$M_{1.33}$	S	.840	.467	.63	46	Some distant cumuli in east and north.
	1.960	$M_{1.24}$						
	1.959	W.M.						
11	1.961	E_0	E−	.841	.331	.60	59	
	1.985	M_3						
	1.976	M_2						
	1.981	$M_{1.5}$						
	1.978	W.M.						
12	1.989	M_2	S−	.834	.351	.66	48	Cirri in west. Cumuli forming in east.
	1.964	$M_{1.5}$						
	1.981	W.M.						
13	1.963	M_3	S	.836	.292	.60	52	Streak of cirri low in east.
	1.960	M_2						
	1.955	$M_{1.6}$						
	1.959	W. M.						
14	1.932	E_0	VG	.846	.344	.49	46	Very distant cirri in northeast.
	1.985	M_3						
	1.968	M_2						
	1.956	$M_{1.5}$						
	1.962	W. M.						
15	1.986	M_3	S	.847	.378	.42	36	
	1.965	M_2						
	1.967	$M_{1.5}$						
	1.969	W. M.						
16	1.965	M_2	S	.841	.429	.56	43	Streaks of cirro-c umul in east and south.
	1.966	$M_{1.5}$						
	1.965	W. M.						
17	1.931	E_0	E−	.833	.307	.64	60	Trace of cirri in northeast.
	1.972	M_3						
	1.964	M_2						
	1.964	$M_{1.5}$						
	1.962	W. M.						
18	1.946	M_3	S	.834	.339	.66	52	
	9.955	M_2						
	1.961	$M_{1.5}$						
	1.954	W. M.						
19	1.936	$M_{1.29}$	S−	.832	.481	.67	42	Thin cirri in east. Sun possibly in very thin cirri during observations.
	1.944	$M_{1.23}$						
	1.940	W. M.						
20	1.932	$M_{1.26}$	S−	.836	.508	.74	46	Thin cirri in east and north.
	1.930	$M_{1.22}$						
	1.931	W. M.						
21	1.918	M_3	S−	.824	.275	.62	51	Cirri low in east spreading to north. Cumuli forming in east.
	1.952	M_2						
	1.944	$M_{1.5}$						
	1.941	W. M.						
22	1.925	$M_{1.16}$	S−	.819	.425	.88	56	Scattered cirro-cumuli in east and south. Cumuli in north.
	1.930	$M_{1.13}$						
	1.927	W. M.						
23	1.850	M_2	U	.820	.359	.83	65	Cirro-cumuli low in east.
	1.881	$M_{1.5}$						
	1.866	W. M.						
24	1.906	M_2	S−	.825	.340	.71	51	Few small cumuli in north and south. Small cirro-cumuli in east.
	1.904	$M_{1.5}$						
	1.905	W. M.						
26	1.955	$M_{1.5}$	S	.829	.354	.76	54	Cirri in east. Cumuli forming in northwest and south.
	1.951	$M_{1.90}$						
	1.953	W. M.						
27	1.967	E_0	E−	.855	.492	.35	34	
	1.978	M_3						
	1.964	M_2						
	1.956	$M_{1.5}$						
	1.966	W. M.						
28	1.945	M_3	S−	.866	.535	.30	25	
	1.970	M_2						
	1.960	$M_{1.5}$						
	1.958	W. M.						
29	1.953	E_0	E−	.854	.426	.31	27	
	1.976	M_3						
	1.975	M_2						
	1.966	$M_{1.5}$						
	1.969	W. M.						
30	1.924	E_0	VG	.851	.451	.37	33	
	1.955	M_3						
	1.952	M_2						
	1.940	$M_{1.6}$						
	1.951	W. M.						
31	1.959	E_0	VG−	.845	.425	.31	29	Cirro-cumuli in northeast and little in west.
	1.965	M_2						
	1.937	$M_{1.5}$						
	1.957	W. M.						