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SOLAR OBSERVATIONS.

SOLAR AND SKY RADIATION MEASUREMENTS DURING APRIL, 1921.

By HERBERT H. KIMBALL, Meteorologist.

[Solar Radiation Investigations Section, Washington, June 30, 1921.]

For a description of instruments and exposures, and an account of the methods of obtaining and reducing the measurements, the reader is referred to this REVIEW for April, 1920, **48**:225.

From Table 1 it is seen that solar radiation intensities averaged slightly above the normal at all the stations. At Santa Fe, maximum noon intensities of 1.60 gr. cal. per min. per sq. cm. measured on the 19th and 25th are very close to the previous high record for May of 1.61.

Table 2 shows a deficiency for the month in the total radiation received from the sun and sky at Washington, close to the normal amount for May at Madison, and a slight excess at Lincoln.

Skylight polarization measurements obtained on nine days at Washington give a mean of 56 per cent, and a maximum of 63 per cent on the 9th. Measurements obtained at Madison on 5 days give a mean of 66 per cent, and a maximum of 70 per cent on the 4th. These are slightly above the average values for May at both stations.

TABLE 1.—*Solar radiation intensities during May, 1921.*

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

WASHINGTON, D. C.

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 meridian 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.
May 2	6.76	0.75	0.88	1.02	1.20	1.40					6.50
7	6.76				1.16	1.45					6.02
9	6.27			0.82	1.11	1.44	0.80	0.43			4.75
10	7.57	0.63	0.74	0.85	1.04	1.23					7.04
14	13.13					1.35	1.03				8.48
17	4.95	0.66	0.77	0.93	1.13	1.42	1.07	0.86	0.75		5.16
18	8.48	0.53	0.63	0.78	0.98	1.22					9.83
20	9.83		0.51		0.88						7.57
31	13.13			0.85	1.08	1.35	1.03	0.87	0.75		13.13
Means		0.64	0.71	0.88	1.07	1.36	0.98	0.72	(0.75)		
Departures		+0.03	−0.01	+0.06	+0.08	+0.07	−0.01	−0.05	+0.04		

*Extrapolated.

MADISON, WIS.

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

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 meridian 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.
May 4	5.16				1.24	1.45					6.76
5	6.27				1.21	1.41					7.29
6	6.50					1.34					7.04
7	6.27				1.21	1.38					6.27
8	7.29			0.91							5.36
Means				(0.91)	1.22	1.40					
Departures				−0.05	+0.11	+0.05					

LINCOLN, NEBR.

May 2	4.75					1.56	1.20	1.14	0.95	0.85	3.99
3	4.57		0.93	1.00	1.21	1.49					6.02
4	4.95		0.79	0.87	1.04						5.36
5	6.02		0.60	0.74	0.96						7.04
6	6.50		0.77								6.76
12	9.83		0.80	0.87	1.21						9.14
13	5.56		0.94	1.12	1.30	1.55					6.02
14	3.99		0.92	1.03							6.02
20	13.13						1.07	0.80			14.10
26	13.61						1.15				10.59
28	11.38		0.87	1.02	1.17	1.36					13.13
Means			0.83	0.98	1.15	1.49	1.17	(0.97)	(0.95)	(0.85)	
Departures			+0.01	+0.02	+0.01	+0.11	+0.10	+0.08	+0.20	+0.14	

SANTA FE, N. MEX.

May 3	4.17		1.13	1.23	1.34	1.47					2.36
5	3.15	1.03	1.14	1.24							1.78
12	3.45		1.06	1.22	1.37						2.62
18	4.37		1.07	1.18	1.27						3.81
19	4.57			1.22	1.40	1.60	1.40	1.22			2.16
20	3.00		1.08								3.15
24	7.04		1.07	1.21	1.40						5.79
25	3.63		1.08	1.22	1.39	1.60	1.34	1.22	1.07		2.49
27	4.57							1.23			3.45
28	3.63		1.07	1.19	1.31						2.36
Means		(1.03)	1.09	1.21	1.35	1.56	(1.37)	1.22	(1.07)		
Departures		+0.02	+0.02	+0.03	+0.05	+0.04	+0.09	+0.01	−0.05		

TABLE 2.—*Solar and sky radiation received on a horizontal surface.*

Week beginning.	Average daily radiation.			Average daily departure for the week.			Excess or deficiency since first of year.		
	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 30	189	432	560	−275	−17	+97	−1,290	−5,254	+1 392
May 7	426	493	452	− 51	+29	−35	−1,644	−5,049	+1,146
14	605	464	506	+120	−11	− 4	− 806	−5,124	+1,121
21	422	497	590	− 70	+18	+70	−1,296	−4,995	+1,608
28	567	477	[1] 529	+ 71	−22	− 6	− 801	−5,152	+[2]1,576

[1] For the five days ending June 1. [2] June 1.

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

By C. G. ABBOT, Assistant Secretary.

[Smithsonian Institution, Washington, June 29, 1921.]

In continuation of preceding publications, I give in the following table the results obtained at Montezuma, near Calama, Chile, in April, 1921, for the solar constant of radiation. The reader is referred to this REVIEW for February, August, and September, 1919, for statements of the arrangement and meaning of the table.

Readers will have noted that the number of observations reported from Chile in the months of January, February, and March was, relative to the former years, very small, and the same is true, to a less extent, of April. Furthermore, the observations reported are almost exclusively taken by the short method. Owing to the empirical nature of the short method, it is our purpose to confirm the accuracy of these values by frequent simultaneous applications of the longer and fundamental method of observing. The unprecedented cloudiness of the Chile station for the first four months of the year 1921 has been the cause both of the paucity of observations and of the almost complete lack of observations by the fundamental method. This feature of the weather in Chile is but another instance of the extraordinary character of the weather thus far in the year 1921 in many parts of the world.

Date.	Solar constant.	Method.	Grade.	Transmission coefficient at 0.5 micron.	Humidity.			Remarks.
					ρ/ρ -.C.	V. P.	Rel. Hum.	
1921.								
A. M.	*Cal.*					*Cm.*	*Per ct.*	
Apr. 1..	1.952	$M_{1.49}$	S—	0.870	0.679	0.36	18	Cirri over high peaks.
	1.942	$M_{1.40}$						
	1.948	W. M.						
2..	1.957	$M_{1.23}$	S—	.878	.736	.26	11	Some cirri in north.
5..	1.965	$M_{1.45}$	S—	.876	.684	.33	12	
6..	1.953	$M_{1.25}$	S—	.874	.725	.23	10	Some cirri in north and east.
P. M.								
8..	1.946	$M_{1.44}$	S	.865	.614	.29	13	Cirri prevented earlier observations.
	1.954	$M_{1.37}$						
	1.950	W. M.						
A. M.								
9..	1.952	$M_{1.23}$	S—	.867	.648	.34	19	
	1.947	$M_{1.20}$						
	1.950	W. M.						
10..	1.918	$M_{2.10}$	S—	.859	.456	.55	39	Cirri in north and east.
	1.938	$M_{1.93}$						
	1.931	W. M.						
12..	1.926	M_3	S	.870	.498	.39	31	Cirri in north and west.
	1.917	$M_{2.5}$						
	1.923	M_2						
	1.922	W. M.						
14..	1.955	$M_{1.28}$	S—	.869	.592	.37	19	Cirri prevented earlier observations.
	1.957	$M_{1.25}$						
	1.956	W. M.						
15..	1.944	$M_{1.29}$	S—	.875	.674	.30	15	Little cirri in west.
	1.951	$M_{1.24}$						
	1.947	W. M.						
P. M.								
16..	1.952	$M_{1.5}$	S—	.878	.661	.29	11	Cirri prevented morning observations.
	1.939	$M_{1.67}$						
	1.946	W. M.						
A. M.								
17..	1.956	$M_{1.72}$	S—	.877	.655	.27	17	Some cirri in north and east.
	1.948	$M_{1.55}$						
	1.952	W. M.						
18..	1.944	$M_{1.33}$	S—	.877	.706	.25	12	Little cirri low in east.
	1.946	$M_{1.26}$						
	1.945	W. M.						
19..	1.934	M_2	S—	.877	.610	.23	16	
	1.903	$M_{2.35}$						
	1.920	W. M.						
P. M.								
21..	1.921	$M_{2.36}$	S—	.880	.620	.13	62	Cumulus in east, some cirri in north, east, and west.
25..	1.946	$M_{1.55}$	S—	.879	.725	.18	77	Cirri scattered about sky.