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SECTION I.—AEROLOGY.

SOLAR AND SKY RADIATION MEASUREMENTS DURING MARCH, 1917.

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[Dated: Washington, D. C., Apr. 27, 1917.]

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, 1917, 45 : 2.

The monthly means and departures from normal values in Table 1 show that direct solar radiation averaged below its normal intensity at Washington, D. C., and very close to its normal intensity at the other three stations.

At 10 a. m of March 23 an intensity of 1.66 calories per square centimeter of normal surface was measured at Santa Fe, N. Mex., and at noon of the same day an intensity of 1.56 calories was measured at Lincoln, Nebr. These are the highest intensities ever measured at these stations in March.

Table 3 shows a deficiency of about 5 per cent in the total radiation for the month at Washington and Madison, and very close to the normal amount at Lincoln.

On account of unfavorable atmospheric conditions, due in some cases to the presence of local smoke, only two series of observations permit of extrapolation to zero air mass. These, as shown in Table 4, give average values of the solar constant.

TABLE 1.—Solar radiation intensities during March, 1917.

[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°	70.0°	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
<b>A. M.</b>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>
Mar. 6	1.28	1.10	0.91	0.87	0.79	0.69	0.64	0.59	0.55	
7	1.22	1.02	0.84	0.80	0.70	0.64	0.59			
10	0.98	0.88	0.84	0.80	0.70	0.64	0.59			
19	1.23	1.02	0.89	0.76	0.73					
22	1.13	0.95	0.76	0.73						
24	1.26									
28	1.49	1.40	1.31	1.19	1.11	1.04	0.97	0.91	0.86	0.82
30	1.54	1.34	1.18	1.07	0.96	0.87	0.79	0.72	0.65	
<b>Monthly means</b>	(1.52)	1.23	1.07	0.95	0.89	0.83	0.76	0.72	0.70	(0.68)
<b>Departure from 9-year normal</b>	-0.07	-0.09	-0.11	-0.07	-0.04	-0.04	-0.04	-0.04	-0.05	-0.03
<b>P. M.</b>										
Mar. 6	1.23	1.15	1.04	0.92	0.84	0.80	0.77	0.76	0.72	
7	1.23	1.05								
8	1.16	1.02	0.94	0.85	0.78	0.72	0.66			
15	1.24	1.10	0.99							
19	1.27	1.05	0.92	0.81	0.68	0.62	0.58	0.53	0.48	
22	1.16	1.04	0.92	0.85						
24	1.22	0.97	0.73	0.69	0.67	0.63	0.59	0.56		
25	1.24	1.01								
28	1.36	1.27	1.18	1.09	1.00	0.92	0.85	0.80	0.77	
30	1.36	1.22	1.12	1.04	0.96	0.91	0.89			
<b>Monthly means</b>	1.26	1.12	1.00	0.92	0.83	0.78	0.73	0.66	0.66	
<b>Departure from 9-year normal</b>	-0.04	-0.03	-0.03	-0.03	-0.04	-0.03	±0.00	-0.02	+0.01	

TABLE 1.—Solar radiation intensities during March, 1917—Continued.

Madison, Wis.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.0°	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
<b>A. M.</b>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>
Mar. 1	1.58	1.49	1.39	1.34	1.30	1.23	1.17	1.08	1.12	1.06
5		1.40	1.30	1.22	1.16	1.10	1.00			
15		1.41	1.28	1.20	1.12	1.02	0.94			
20		1.39	1.24	1.17	1.13	1.07	1.02			
<b>Monthly means</b>	1.44	1.33	1.24	1.19	1.15	1.07	(1.12)	(1.12)	(1.06)	
<b>Departure from 7-year normal</b>	±0.00	-0.01	-0.03	-0.02	+0.01	±0.00	+0.03	+0.14	+0.06	
<b>P. M.</b>										
Mar. 1	1.56	1.50	1.42	1.34	1.26					
2		1.31	1.14	0.99						
20		1.36	1.28	1.17						
21		1.41	1.26	1.17						
24		1.36	1.21	1.08	0.99					
<b>Monthly means</b>	(1.46)	1.34	1.23	1.15	(1.26)					
<b>Departure from 7-year normal</b>	+0.04	±0.00	-0.05	-0.06	+0.03					

Lincoln, Nebr.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.0°	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
<b>A. M.</b>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>
Mar. 3	1.53	1.42	1.24	1.23	1.02	1.01	0.88			
8		1.44	1.29	1.16	0.99	0.92	0.88	0.84		
9					1.13	1.09	1.04	1.00		
14		1.47	1.24		0.94					
17		1.14								
19		1.52								
22		1.52	1.48	1.23	1.17	1.10				
<b>Monthly means</b>	1.44	1.36	1.21	1.09	1.03	0.93	(0.84)	(1.00)		
<b>Departure from 2-year normal</b>	+0.02	±0.00	-0.03	-0.05	-0.01	+0.03	-0.03	-0.01		
<b>P. M.</b>										
Mar. 3	1.55			1.24	1.17					
8		1.46								
14		1.43	1.39	1.32	1.28	1.14	1.07	1.02	0.96	
18		1.38								
20		1.44	1.32	1.20	1.12					
21		1.54								
23		1.38	1.31	1.20						
24		1.46	1.34	1.25	1.17	1.08	1.02	0.97	0.92	
28		1.43	1.20	1.20	1.08	0.99	0.95		0.84	
<b>Monthly means</b>	1.45	1.31	1.23	1.17	1.10	1.01	(1.00)	0.91		
<b>Departure from 2-year normal</b>	+0.02	±0.00	+0.01	+0.03	+0.04	+0.03	+0.06	+0.03		

TABLE 1.—Solar radiation intensities during March, 1917—Continued.  
Santa Fe, N. Mex.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.0°	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.
Mar. 8	1.56				1.28	1.18				
12		1.50								
14										
23	1.65	1.65								
24		1.56	1.48	1.42	1.36	1.30				
27	1.54	1.51	1.47	1.43	1.35	1.28	1.21	1.15		
28	1.56	1.50			1.38	1.34				
Monthly means	1.58	1.55	(1.48)	1.41	1.33	1.30	(1.21)	(1.15)		
Departure from 5 year normal	±0.00	+0.03	+0.01	+0.01	-0.01	+0.03	-0.01	-0.01		
P. M.										
Mar. 8		1.53	1.49	1.42	1.33	1.25				
14		1.59	1.45	1.36	1.28	1.20				
23		1.56	1.51							
24			1.45	1.36	1.29	1.23				
27		1.33	1.19	1.17						
28		1.30	1.22	1.13	1.08	1.01	0.96			
Monthly means		1.46	1.38	1.29	1.24	1.17	(0.96)			

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

Washington, D. C.			Madison, Wis.			Lincoln, Nebr.			Santa Fe, N. Mex.		
Date.	8 a.m.	3 p.m.	Date.	8 a.m.	3 p.m.	Date.	8 a.m.	3 p.m.	Date.	8 a.m.	3 p.m.
1917.	mm.	mm.	1917.	mm.	mm.	1917.	mm.	mm.	1917.	mm.	mm.
Mar. 6	1.60	2.49	Mar. 1	0.83	1.83	Mar. 3	1.68	1.52	Mar. 8	1.68	1.96
7	3.00	3.63		2.17	1.88		2.49	2.49		2.06	2.16
8	7.29	3.15		5.07	1.68		2.49	3.00		1.88	1.68
10	3.81	3.18		15.26	3.00		2.74	2.74		2.31	1.88
15	4.76	3.45		20.30	3.61		2.36	2.74		2.36	5.16
19	1.60	3.00		21.30	3.15		2.06	2.87		2.36	1.68
22	4.95	3.38		24.3.63	4.57		3.99	3.63		1.52	1.96
24	5.79	4.37					3.45	3.81			
25	4.87	4.37					3.63	3.15			
28	2.52	2.87					4.57	4.95			
30	3.15	4.37					3.45	4.37			
							2.74	2.62			
							2.26	1.78			
							2.49	3.81			
							3.15	2.06			

TABLE 3.—Daily totals and departures of solar and sky radiation during March, 1917.

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

Day of month.	Daily totals.			Departures from normal.			Excess or deficiency since first of month.		
	Wash- ington.	Mad- ison.	Lin- coln.	Wash- ington.	Mad- ison.	Lin- coln.	Wash- ington.	Mad- ison.	Lin- coln.
Mar. 1	calories.	calories.	calories.	calories.	calories.	calories.	calories.	calories.	calories.
1	73	441	356	-222	144	17	-222	144	17
2	79	412	321	-220	111	-21	-442	255	-4
3	65	426	409	-237	120	65	-679	375	61
4	62	442	426	-244	134	80	-923	509	141
5	313	411	312	4	99	-36	-919	608	105
6	499	288	351	157	-27	2	-762	581	107
7	472	105	240	157	-213	-111	-605	368	-4
8	302	101	423	-16	-220	71	-621	148	67
9	292	269	354	-29	-54	0	-650	94	67
10	430	124	383	106	-202	28	-544	-108	95

TABLE 3.—Daily totals and departures of solar and sky radiation during March, 1917—Continued.

Day of month.	Daily totals.			Departures from normal.			Excess of deficiency since first of month.		
	Wash- ington.	Mad- ison.	Lin- coln.	Wash- ington.	Mad- ison.	Lin- coln.	Wash- ington.	Mad- ison.	Lin- coln.
Mar. 11	calories.	calories.	calories.	calories.	calories.	calories.	calories.	calories.	calories.
11	168	127	349	-158	-201	-8	-702	-309	87
12	420	286	35	91	-45	-323	-611	-354	-236
13	84	64	123	-248	-270	-237	-859	-624	-473
14	38	358	459	-297	21	98	-1,156	-603	-307
15	455	432	168	117	93	-195	-1,039	-510	-579
16	426	78	93	85	-264	-271	-954	-774	-841
17	119	441	398	-225	96	32	-1,179	-678	-809
18	305	528	456	-42	180	89	-1,221	-498	-720
19	538	437	412	188	87	44	-1,033	-411	-676
20	386	493	432	33	140	62	-1,000	-271	-614
Decade departure							-456	-163	-799
21	47	469	455	-309	113	84	-1,309	-158	-530
22	483	453	408	124	95	36	-1,185	-63	-494
23	259	152	494	-103	-209	111	-1,288	-272	-383
24	480	523	477	115	159	103	-1,173	-113	-280
25	528	362	384	160	-4	9	-1,013	-117	-271
26	474	131	326	103	-238	-50	-910	-355	-321
27	60	279	501	-314	-92	124	-1,224	-447	-197
28	598	420	483	221	46	105	-1,003	-401	-92
29	471	395	493	91	19	114	-912	-382	22
30	607	419	446	225	40	66	-687	-342	88
31	508	176	332	123	-205	-49	-564	-547	39
Decade departure							+436	-276	653
Excess or deficiency since first of year.	calories.						-1,357	+1,538	-366
(Per cent)							-5.9	+6.8	-1.4

TABLE 4.—Solar radiation intensities for zenithal sun reduced to mean solar distance of the earth, and approximate values of the solar constant.

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

Station.	Date.	Radiation intensity.		Solar constant.
		m = 1	m = 0	
Madison, Wis.	1917. Mar. 1, p. m.	calories.	calories.	calories.
		1.65	1.85	1.93
Lincoln, Nebr.	28, p. m.	1.56	1.82	1.93

Skylight polarization measurements at Washington give a mean of 60 per cent, and a maximum of 65 per cent on the 28th. These are slightly below average March values for Washington.

METEOROLOGICAL OBSERVATIONS BY AN AERONAUT.<sup>1</sup>

[Exprinted from Nature, London, Mar. 22, 1917, 99: 73.]

Lieut. Douglas, Royal Flying Corps, gives some details of his experience during his ascents among the clouds in northern France. He finds stratus cloud most frequently in anticyclones and round their eastern and northern borders. The top in such cases is very flat and even, and an inversion of temperature is met with at the upper surface. The lowest temperature is generally at the top of the cloud, but is occasionally met with a little lower. If cumuli attain sufficient height they develop into thunderstorms, but at least 6,000 feet (1,828.8 m.) from top to bottom is required for this to happen, and on all occasions in 1916 when thunder developed the height was not less than 10,000 feet (3,048 m.). Mr. Douglas states that cirrus and cirrostratus almost certainly consist of thin snow.

<sup>1</sup>Journal, Scott. meteorol. soc., No. 33.