SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS OBTAINED DURING APRIL, 1931

By HERBERT H. KIMBALL

For a description of instruments employed and their exposures, the reader is referred to the January, 1931, REVIEW, p. 41.

Table 1 shows that solar radiation intensities averaged below the normal intensities for April at all three stations. At Madison, Wis., on the 10th a high wind caused a dust storm of unusual density. The radiation intensity at normal incidence was reduced from 1.20 at 9:30 a. m., with air mass 1.5, to 0.141 at 2:07 p. m., with air mass 1.45. Skylight polarization, at 3:44 p. m., with the sun 30° above the horizon (m=2.0) was less than 20 per cent, indicating that the depletion was due to reflection from rather coarse particles. The visibility, according to Weather Bureau officials at Madison, was only 3 miles.

Table 2 shows a deficiency in the total radiation received on a horizontal surface as compared with the normal amount for April at La Jolla and Fresno and an excess at all other stations for which normals have been computed.

Skylight polarization measurements obtained on 11 days at Madison, give a mean of 55 per cent and a maximum of 66 per cent on the 29th. At Washington, measurements obtained on four days give a mean of 59 per cent, with a maximum of 66 per cent on the 8th. These are slightly above the corresponding averages for Washington. At Madison, the values were slightly below the corresponding April averages for that station.

TABLE 1.—*Solar radiation intensities during April, 1931*

[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 mer. time	Air mass									Local mean solar time
		A. M.					P. M.				
	e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Apr. 8	3.45	------	------	1.05	1.13	------	1.00	0.85	0.68	0.58	4.17
Apr. 13	4.95	------	0.83	0.95	1.16	1.40	1.08	0.86	------	------	4.37
Apr. 14	5.79	------	------	0.73	0.85	1.07	------	------	------	------	6.50
Apr. 15	4.37	------	------	0.60	0.89	1.15	0.92	0.62	0.47	------	4.57
Apr. 16	6.76	0.47	0.60	0.76	0.97	1.27	0.49	------	------	------	4.17
Apr. 17	5.36	------	0.36	0.49	0.59	0.90	------	------	------	------	6.27
Apr. 20	7.04	0.62	0.75	0.88	1.00	1.39	1.01	------	------	------	4.17
Apr. 27	2.49	0.80	0.94	1.09	------	------	------	------	------	------	2.74
Apr. 28	3.45	------	------	------	------	1.32	1.02	------	------	------	3.30
Apr. 30	3.63	------	0.82	0.98	1.17	1.43	------	------	------	------	2.74
Means	------	0.63	0.72	0.84	0.97	1.24	0.92	0.78	(0.58)	(0.58)	------
Departures	------	−0.07	−0.04	−0.05	−0.10	−0.11	−0.15	−0.11	−0.15	−0.04	------

[1] Extrapolated.

TABLE 1.—*Solar radiation intensities during April, 1931*—Contd.

Madison, Wis.

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 mer. 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.*
Apr. 1	3.81	------	------	------	------	1.40	1.23	------	------	------	3.00
Apr. 4	3.30	0.54	0.66	------	------	1.39	------	------	------	------	2.87
Apr. 6	3.99	------	------	------	1.20	1.50	1.13	------	------	------	2.74
Apr. 7	3.30	------	------	------	------	------	0.98	------	------	------	4.75
Apr. 8	6.50	------	------	------	1.00	1.46	0.99	------	------	------	7.57
Apr. 10	4.95	------	------	------	1.13	------	[1] 0.26	------	------	------	8.15
Apr. 11	2.87	------	0.80	0.98	1.13	1.32	------	------	------	------	2.49
Apr. 17	5.16	------	------	------	------	1.32	1.03	------	------	------	4.17
Apr. 18	4.37	------	------	0.74	1.01	1.25	------	------	------	------	5.16
Apr. 24	2.62	------	------	------	1.06	------	------	------	------	------	2.49
Apr. 25	3.99	------	------	0.73	0.88	------	------	------	------	------	3.99
Apr. 27	2.74	------	------	------	------	1.43	------	------	------	------	2.87
Apr. 29	3.00	------	------	------	1.20	1.45	------	------	------	------	2.36
Apr. 30	3.15	------	0.76	0.87	1.06	1.35	1.01	------	------	------	3.30
Means	------	(0.54)	0.74	0.83	1.07	1.39	1.06	------	------	------	------
Departures	------	−0.30	−0.18	−0.21	−0.13	−0.03	−0.13	------	------	------	------

Lincoln, Nebr.

Apr. 1	3.81	------	0.75	0.94	1.17	1.44	------	------	------	------	4.37
Apr. 5	3.15	------	------	------	------	1.44	1.20	1.03	0.90	0.75	3.45
Apr. 6	3.81	------	0.90	1.04	------	------	------	------	------	------	4.95
Apr. 7	5.36	0.75	0.81	0.96	1.13	------	------	------	------	------	8.18
Apr. 8	6.76	------	------	1.05	1.21	1.43	------	------	------	------	5.56
Apr. 10	4.17	0.40	0.53	0.69	0.86	------	------	------	------	------	3.99
Apr. 11	6.27	------	0.83	0.96	1.13	1.30	------	------	------	------	6.02
Apr. 22	3.15	0.64	0.73	0.85	1.07	1.27	------	------	------	------	3.30
Apr. 26	3.15	0.72	0.86	0.93	1.12	------	------	------	------	------	3.45
Apr. 27	3.63	------	0.72	0.94	1.10	1.38	1.11	0.93	0.75	------	3.15
Apr. 28	6.76	------	0.75	0.90	1.09	------	------	------	------	------	5.79
Means	------	0.63	0.76	0.93	1.10	1.38	(1.16)	(0.98)	(0.82)	(0.75)	------
Departures	------	−0.09	−0.07	−0.05	−0.10	−0.06	−0.01	±0.00	−0.03	+0.03	------

[1] Not included in means.

TABLE 2.—*Total solar radiation (direct+diffuse) received on a horizontal surface*

[Gram calories per square centimeter]

Week beginning	Average daily totals											
	Washington	Madison	Lincoln	Chicago	New York	Twin Falls	Pittsburgh	Gainesville	Fresno	La Jolla	Miami	New Orleans
1931	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 2	248	461	400	373	241	472	263	562	524	400	442	379
Apr. 9	552	422	487	380	461	500	476	495	572	438	349	244
Apr. 16	503	332	468	251	463	556	409	621	623	402	454	388
Apr. 23	483	516	428	263	267	496	293	647	524	339	442	380
	Departures from weekly normals											
Apr. 2	−131	+73	−25	+81	−67	+72	−25	+36	−8	−22	----	----
Apr. 9	+144	+20	+66	+64	+123	+57	+96	−44	+4	+3	----	----
Apr. 16	+84	−64	+35	−55	+122	+78	+67	+49	+36	−30	----	----
Apr. 23	+57	+82	−30	−60	−84	−28	−43	+29	−69	−80	----	----
Accumulated departures on Apr. 29	+579	−2,121	−679	−588	+1,204	[1] +2,863	−514	+1,773	+238	−763	----	----

[1] Records for February missing.