

SOLAR RADIATION AND SUNSPOT DATA FOR APRIL 1941

SOLAR RADIATION OBSERVATIONS

By HELEN CULLINANE

Measurements of solar radiant energy received at the surface of the earth are made at 9 stations maintained by the Weather Bureau and at 12 cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Madison, Wis.; Lincoln, Nebr., and Albuquerque, N. Mex.) and at the Blue Hill Observatory at Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau station at Madison and at Blue Hill Observatory.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data obtained, up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Lincoln, Madison, Albuquerque, and Blue Hill the observations are obtained with a recording thermopile, checked by observations with a Smithsonian silver-disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 7:30 a. m. and at 1:30 p. m. (75th meridian time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Direct solar radiant energy was considerably below normal at both Blue Hill and Madison, while the few measurements at Lincoln were considerably above normal.

Total solar and sky radiation was considerably below normal at Lincoln, Fresno, and Fairbanks, and excessive at Washington, Chicago, Blue Hill, and Friday Harbor.

Polarization observations made at Madison on 5 days give a mean of 59 percent, and a maximum of 59 percent. The mean is exactly equal to the normal, while the maximum is considerably below.

Pyrheliometric apparatus for the measurement of the intensity of direct solar radiation at normal incidence has just been installed at Albuquerque and Lincoln.

TABLE 1.—Solar radiation intensities during April 1941

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

LINCOLN, NEBR.												
Date	Sun's zenith distance										Local mean solar time	
	7:30 a. m.	73.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°		1:30 p. m.
	75th mer. time	Air mass										
		A. M.					P. M.					
e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.		
Apr. 23.....	mm. 5.8	cal. -----	cal. -----	cal. -----	cal. -----	cal. 1.46	cal. -----	cal. -----	cal. -----	cal. -----	mm. 5.2	
Apr. 24.....	4.6	-----	-----	1.19	1.28	-----	-----	-----	-----	-----	5.8	
Means.....	-----	-----	-----	(1.19)	(1.28)	(1.46)	-----	-----	-----	-----	-----	
Departures.....	-----	-----	-----	+ .21	+ .10	+ .15	-----	-----	-----	-----	-----	

MADISON, WIS.											
Apr. 2.....	3.6	0.69	0.84	-----	-----	-----	-----	-----	-----	-----	4.2
Apr. 22.....	4.2	-----	.76	1.02	1.18	1.38	-----	-----	-----	-----	4.8
Apr. 23.....	6.0	-----	.90	-----	-----	-----	-----	-----	-----	-----	4.6
Apr. 24.....	4.4	-----	.94	1.04	1.21	1.46	-----	-----	-----	-----	4.4
Apr. 25.....	4.2	.73	.80	.91	1.08	1.41	-----	-----	-----	-----	4.6
Apr. 28.....	7.9	-----	-----	-----	.88	1.27	-----	-----	-----	-----	6.5
Apr. 29.....	6.8	.42	.55	.66	.86	1.11	-----	-----	-----	-----	6.8
Means.....	.61	.80	.91	1.04	1.33	-----	-----	-----	-----	-----	-----
Departures.....	-.18	-.12	-.14	-.16	-.10	-----	-----	-----	-----	-----	-----

As a result of the recalibration work now being conducted, new factors for the instruments at La Jolla, Calif., Albuquerque, N. Mex., New Orleans, La., and Washington, D. C., make the following changes necessary in table 2.

Week beginning	La Jolla, Calif.		Washington, D. C.		New Orleans, La.		Albuquerque, N. Mex.	
	Cal.	Departure	Cal.	Departure	Cal.	Departure	Cal.	Departure
Jan. 1.....	230	-9	174	+5	-----	-----	-----	-----
Jan. 8.....	207	-51	194	+49	-----	-----	-----	-----
Jan. 15.....	297	+16	137	-19	-----	-----	-----	-----
Jan. 22.....	210	-81	94	-182	-----	-----	-----	-----
Jan. 29.....	348	+66	194	-8	-----	-----	284	-11
Feb. 5.....	302	-15	263	+48	-----	-----	360	+19
Feb. 12.....	243	-60	230	+4	-----	-----	360	+13
Feb. 19.....	316	-54	353	+95	-----	-----	307	-60
Feb. 26.....	341	-67	269	-11	383	+112	496	+69
Mar. 5.....	428	+15	264	-46	315	-9	458	+108
Mar. 12.....	379	-31	376	+56	276	-71	388	-20
Mar. 19.....	506	+69	357	+13	250	-106	397	-52
Mar. 26.....	470	-16	377	+30	480	+147	614	+89

TABLE 2.—Average daily totals of solar radiation (direct + diffuse) received on a horizontal surface

[Gram-calories per square centimeter]

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Cambridge	Fairbanks	Twin Falls	La Jolla	Newport	New Orleans	Riverside	Blue Hill	Albuquerque	Friday Harbor
Apr. 2.....	cal. 379	cal. 330	cal. 98	cal. 290	cal. 496	cal. 480	cal. 393	cal. 306	cal. 461	cal. 586	cal. 401	cal. 495	cal. 506	cal. 394	cal. 551	cal. 271
Apr. 9.....	482	400	333	407	550	427	474	310	355	376	500	559	302	481	594	458
Apr. 16.....	492	347	438	303	636	651	534	316	536	629	551	339	616	527	626	602
Apr. 23.....	508	564	550	581	601	609	376	376	552	354	400	376	473	379	496	561

DEPARTURES FROM WEEKLY NORMALS

Apr. 2.....	+9	-38	-300	-3	+159	-37	-29	-29	+28	+38	-20	+106	+19	+14	-27	-60
Apr. 9.....	+85	-2	-107	+63	+208	-136	+5	-50	-103	-70	+12	+134	-162	+122	+3	+112
Apr. 16.....	+77	-50	-14	-32	+269	+51	+54	-51	+50	+119	+51	-68	+73	+115	+40	+138
Apr. 23.....	+59	+126	+107	+200	+170	+33	-37	+2	+43	-145	-66	-16	+13	-56	-100	+67

ACCUMULATED DEPARTURES ON APR. 30, 1941

+1,848	+1,372	-5,529	+3,689	+10,689	-3,241	-42	-1,288	+1,925	-1,932	+14	+2,835	-3,976	+833	-525	+5,250
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