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SOLAR OBSERVATIONS

SOLAR RADIATION OBSERVATIONS DURING OCTOBER 1937

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January 1935 REVIEW, page 24.

Table 1 shows that solar radiation intensities averaged slightly above normal for October at both Washington and Madison, and slightly below normal at Lincoln and Blue Hill.

Table 2 shows a deficiency in the total amount of solar and sky radiation received on a horizontal surface at all stations with the exception of Lincoln, Fresno, Miami, Riverside, and Blue Hill.

Polarization measurements made at Madison on 4 days give a mean of 59 percent with a maximum of 60 percent on the 13th. Both these values are below the corresponding October normals. A value of 16.2 percent obtained on the 7th is omitted from the means owing to the fact that the sky was nearly covered with cirro stratus at the time the readings were made.

TABLE 1.—*Solar radiation intensities during October 1937*

[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.*
Oct. 7	16.20			1.01	1.14	1.48					7.29
Oct. 8	4.17		0.80	1.01	1.19	1.46					3.99
Oct. 12	8.48						1.12				7.87
Oct. 15	3.81		.82	.99	1.14						3.99
Oct. 16	4.57			.91	1.16						3.00
Oct. 19	13.61						1.18				15.65
Oct. 25	4.37	0.75	.87	1.03	1.22		1.18				3.45
Oct. 29	9.14			1.10	1.24						3.99
Oct. 30	5.79	.70	.79	.85	.97						7.29
Means		(.72)	.82	.99	1.15	(1.47)	1.16				
Departures		−.03	−.03	+.02	+.01	+.05	+.03				

TABLE 1.—*Solar radiation intensities during October 1937*

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

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] 1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Oct. 6	5.16				1.27						6.02
Oct. 7	3.81		1.04	1.11	1.29						5.16
Oct. 12	6.27						1.37				3.63
Oct. 13	2.62				1.39						2.74
Oct. 14	2.49						1.38				3.00
Oct. 15	3.63			.99							3.63
Oct. 27	4.95						1.38				5.36
Oct. 29	5.79		.94	1.11	1.29						7.57
Means			(.99)	1.07	1.31		1.20				
Departures			+.07	+.02	+.11		+.12				

LINCOLN, NEBR.

Oct. 3	8.48	0.72	0.83	0.99	1.18	1.35					10.21
Oct. 4	12.24					1.38	1.16	0.94	0.80	0.65	12.68
Oct. 5	10.59				1.22	1.47	1.30	1.09	.94	.83	7.87
Oct. 7	4.57					1.53	1.34	1.15	1.02	.92	4.75
Oct. 21	4.57		.78								3.63
Oct. 31	3.45			.90	1.14						7.57
Means		(.72)	(.80)	(.94)	1.18	1.43	1.27	1.06	.92	.80	
Departures		−.11)	−.13)	−.15	−.10	−.07	+.02	−.02	−.02	−.03	

BLUE HILL, MASS.

Oct. 1	8.6					1.25	1.01				9.0
Oct. 2	10.7				1.20	1.20	1.10	0.91			7.4
Oct. 5	10.7				1.12	1.29	1.21	1.04			11.9
Oct. 8	4.6	1.02	1.08	1.16	1.29	1.44	1.22				3.8
Oct. 9	3.5	1.00	1.09	1.18	1.30	1.44					2.8
Oct. 13	6.3				1.15	1.43	1.21				4.2
Oct. 14	3.0			1.13	1.23	1.37					2.0
Oct. 15	3.3	.82	.96	1.15	1.31	1.49	1.30	1.21	1.14		2.6
Oct. 16	3.3	.75	.89	1.07	1.28	1.40	1.33	1.23	1.15	1.08	3.0
Oct. 17	3.0		.90	1.04	1.23						3.5
Oct. 21	6.1		.77	.96	1.20		1.12	1.04	.96	.93	5.4
Oct. 24	6.3						1.14				5.0
Oct. 25	3.6	.75	.86	1.02	1.11						4.4
Oct. 26	4.4	.78	.88	1.00	1.14	1.32	1.15	1.07			6.1
Oct. 31	4.6	.92	1.04	1.13	1.26	1.40	1.26	1.10			3.2
Means		.86	.94	1.08	1.22	1.37	1.19	1.09	1.08	1.00	
Departures		−.03	+.06	+.18	+.23	−.11	−.07	−.05	−.03	−.03	

[1] Extrapolated.

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

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	Blue Hill	San Juan	Friday Harbor	Ithaca	Newport
	Gram-calories per square centimeter																
1937	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Oct. 1	215	236	357	230	240	468	117	367	404	422	244	378	275	466	297	188	255
Oct. 8	221	301	276	215	218	406	167	311	414	412	312	388	293	596	259	158	262
Oct. 15	243	172	145	125	232	392	91	252	321	386	269	375	288	209	175	140	279
Oct. 22	205	227	294	189	170	359	108	284	191	372	367	352	191	449	124	94	194
	Departures from weekly normals																
Oct. 1	−116	−39	+23	−12	−40	+30	+7	−17	.....	+14	−90	+2	−43	.....	+17	−73	.....
Oct. 8	−83	+57	−28	+3	−44	+1	+81	−15	.....	+28	−31	+13	−31	.....	+19	−98	.....
Oct. 15	−39	−47	−148	−66	+17	+19	+24	−115	.....	+27	−37	+34	−5	.....	−11	−95	.....
Oct. 22	−59	+21	+15	+21	−23	−8	+47	−39	.....	+22	+59	−8	−31	.....	−32	−84	.....
	Accumulated departures on—																
	+182	+7,994	+4,774	+4,956	+5,488	+8,127	+2,541	−1,232	.....	−8,735	+4,242	−3,493	−3,479	.....	−1,659	−7,126	.....

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent, U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	Eastern standard time	Mt. Wilson group number	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1937	*h. m.*		°	°	°				
Oct. 1	11 7	5582	−77.0	141.6	+11.0	485	.....	.....	U. S. Naval.
		5581	−67.0	151.6	+10.5	.....	388	.....	
		5578	−37.0	181.6	+9.5	.....	2,133	.....	
		5579	−36.0	182.6	−19.0	73	.....	.....	
		5577	−27.0	191.6	−12.0	.....	194	.....	
		5583	−19.0	199.6	−27.5	.....	6	.....	
		5580	+19.0	237.6	−14.0	.....	24	.....	
		5572	+33.5	252.1	+16.5	121	.....	.....	
		5575	+34.0	252.6	+39.0	.....	145	.....	
		5570	+44.0	262.6	+13.5	48	.....	3617	
Oct. 2	11 15	5582	−64.0	141.3	+10.5	388	.....	.....	Do.
		5581	−56.0	149.3	+11.0	.....	533	.....	
		5578	−24.0	181.3	+9.5	.....	2424	.....	
		5579	−22.0	183.3	−19.0	61	.....	.....	
		5577	−12.0	193.3	−12.0	.....	145	.....	
		5584	−8.0	197.3	+25.0	.....	97	.....	
		5583	−7.0	198.3	−27.5	.....	24	.....	
		5585	+43.0	248.3	+11.0	.....	73	.....	
		5572	+46.0	251.3	+16.5	121	.....	.....	
		5575	+49.0	254.3	+39.5	.....	12	.....	
		5570	+59.0	264.3	+13.5	.....	12	3890	
Oct. 4	11 1	5587	−70.0	109.0	+15.0	.....	73	.....	Mt. Wilson.
		5582	−38.0	141.0	+11.0	.....	388	.....	
		5581	−27.0	152.0	+10.0	.....	485	.....	
		5578	+5.0	184.0	+10.0	.....	2424	.....	
		5579	+5.0	184.0	−19.0	.....	61	.....	
		5577	+13.0	192.0	−12.0	.....	97	.....	
		5586	+14.0	193.0	+18.0	.....	36	.....	
		5584	+20.0	199.0	+25.0	.....	97	.....	
		5583	+21.0	200.0	−26.5	.....	12	.....	
		(*)	+22.5	201.5	+17.0	.....	12	.....	
		5585	+70.0	249.0	+10.0	.....	48	.....	
		5572	+72.0	251.0	+17.0	.....	97	3850	Do.
Oct. 5	11 9	5590	−70.0	95.8	+14.0	24	.....	.....	
		5587	−54.0	111.8	+15.0	.....	194	.....	
		5582	−24.0	141.8	+11.0	.....	339	.....	
		5581	−14.0	151.8	+10.0	.....	436	.....	
		5588	+12.0	177.8	−13.0	.....	24	.....	
		5579	+18.0	183.8	−19.0	73	.....	.....	
		5578	+19.0	184.8	+ 9.5	.....	2424	.....	
		5577	+28.0	193.8	−12.0	.....	48	.....	
		5584	+33.0	198.8	+24.0	.....	145	.....	
		5585	+83.0	248.8	+11.0	48	.....	3755	
Oct. 6	11 19	5590	−55.0	97.5	+13.5	24	.....	.....	U. S. Naval.
		5587	−39.0	113.5	+13.0	.....	291	.....	
		(*)	−30.0	122.5	+15.0	.....	24	.....	
		5589	−20.0	132.5	+13.0	.....	24	.....	
		5582	−9.0	143.5	+10.5	.....	339	.....	
		5581	−2.0	150.5	+10.0	.....	388	.....	
		5579	+30.0	182.5	−19.0	61	.....	.....	
		5578	+31.0	183.5	+9.0	.....	2424	.....	
		5584	+49.0	201.5	+23.0	.....	48	3623	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group number	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1937	*h. m.*		°	°	°				
Oct. 7	13 32	5590	−41.0	97.1	+13.0	.....	73	.....	U. S. Naval.
		5587	−24.0	114.1	+13.0	.....	339	.....	
		5589	−5.0	133.1	+13.0	.....	12	.....	
		5591	−1.0	137.1	−17.0	.....	12	.....	
		5583	+7.0	145.1	+10.0	339	.....	.....	
		5581	+11.0	149.1	+9.0	.....	388	.....	
		5579	+45.0	183.1	−19.5	54	.....	.....	
		5578	+47.0	185.1	+9.0	.....	2327	.....	
		5586	+58.0	196.1	+15.0	.....	36	.....	
		5584	+64.0	202.1	+21.0	36	.....	3616	
Oct. 8	11 5	5590	−28.5	97.7	+12.0	.....	121	.....	Do.
		5587	−11.0	115.2	+13.0	.....	242	.....	
		5591	+9.0	135.2	−17.0	.....	12	.....	
		5582	+19.0	145.2	+10.0	291	.....	.....	
		5581	+25.0	151.2	+9.0	.....	291	.....	
		5592	+31.0	157.2	+15.0	.....	24	.....	
		5579	+58.0	184.2	−19.5	73	.....	.....	
		5578	+58.0	184.2	+9.0	.....	2327	.....	
		5584	+76.0	202.2	+21.5	6	.....	.....	
		5586	+76.0	202.2	+17.0	6	.....	3393	
Oct. 9	10 52	5596	−72.0	41.1	+25.0	48	.....	.....	Mt. Wilson.
		5595	−42.0	71.1	+14.0	.....	97	.....	
		5594	−23.0	90.1	−17.0	.....	16	.....	
		5590	−14.5	98.6	+13.0	.....	145	.....	
		5587	+3.0	116.1	+13.0	.....	194	.....	
		5591	+22.5	135.6	−18.0	.....	24	.....	
		5582	+31.5	144.6	+10.5	.....	267	.....	
		5581	+39.0	152.1	+10.0	.....	291	.....	
		5592	+45.0	158.1	+15.0	.....	97	.....	
		5579	+70.0	183.1	−20.0	73	.....	.....	
		5578	+72.0	185.1	+9.0	.....	2133	.....	
		5586	+73.0	186.1	+17.0	.....	121	3506	
Oct. 10	12 36	5598	−79.0	20.0	−22.0	.....	48	.....	U. S. Naval.
		5596	−63.0	36.0	+24.0	.....	73	.....	
		5595	−28.0	71.0	+12.0	.....	267	.....	
		5594	−10.0	89.0	−18.0	.....	61	.....	
		5590	+0.5	99.5	+12.0	.....	242	.....	
		5587	+18.0	117.0	+14.0	.....	170	.....	
		5591	+37.0	136.0	−18.0	.....	24	.....	
		5582	+47.0	146.0	+10.0	267	.....	.....	
		5581	+54.0	153.0	+10.5	.....	242	.....	
		5592	+62.0	161.0	+14.0	12	.....	.....	
		5578	+85.0	184.0	+9.0	.....	873	.....	
		5586	+88.0	187.0	+16.0	73	.....	2352	
Oct. 11	11 15	5600	−75.0	11.6	−18.5	194	.....	.....	Do.
		5599	−75.0	11.6	+12.0	145	.....	.....	
		5598	−66.0	20.6	−22.5	.....	73	.....	
		5596	−49.5	37.1	+24.0	.....	61	.....	
		5595	−15.0	71.6	+12.0	.....	388	.....	
		5594	+4.0	90.6	−17.5	.....	145	.....	
		5590	+13.0	99.6	+12.0	.....	145	.....	
		5597	+18.0	104.6	+14.0	.....	145	.....	
		5587	+25.0	111.6	+15.0	.....	36	.....	
		5587	+35.0	121.6	+11.0	.....	73	.....	
		5591	+50.0	136.6	−19.0	6	.....	.....	
		5582	+59.0	145.6	+10.0	.....	267	.....	
		5581	+68.0	154.6	+11.0	.....	194	1872	

*=not numbered.