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SOLAR OBSERVATIONS

SOLAR AND SKY RADIATION MEASURINGS DURING OCTOBER, 1927

By HERBERT H. KIMBALL, Solar Radiation Investigations

For a description of instruments and exposures and an account of the method of obtaining and reducing the measurements, the reader is referred to the REVIEW for January, 1924, **52**:42, January, 1925, **53**:29, and July, 1925, **53**:318.

Table 1 shows that solar radiation intensities were below the normal values for October at Washington, D.C., and Lincoln, Nebr., and close to normal at Madison, Wis. It also shows that for the three stations combined, observations were obtained upon a greater number of days than in any previous month since the establishment of the stations.

Table 2 shows an excess in the total solar radiation received on a horizontal surface directly from the sun and diffusely from the sky, at all three stations for which normals have been determined, as compared with the October normals for these stations.

Skylight polarization measurements at Washington made on 8 days give a mean of 55 per cent, with a maximum of 57 per cent on the 4th. At Madison measurements on 11 days give a mean of 69 per cent, with a maximum of 76 per cent on the 21st. These are above normal values for October at Madison and considerably below at Washington.

TABLE 1.—*Solar radiation intensities during October, 1927*

[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	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Oct. 4	10.59			1.08	1.19		1.20	1.04			9.83
Oct. 5	6.27		0.81	1.00	1.15	1.31					9.14
Oct. 6	11.84	0.56	0.68	0.83	0.98	1.31	1.04	0.83	0.69	0.58	13.13
Oct. 7	13.13	0.76	0.85	1.00	1.15						14.10
Oct. 10	7.29	0.65	0.77	0.90	1.10	1.39					8.48
Oct. 11	9.14	0.56									9.47
Oct. 14	6.27			1.02	1.12						5.16
Oct. 15	6.27	0.78	0.86	0.98	1.16	1.36					5.79
Oct. 21	6.27	0.65	0.77	0.97	1.17	1.45	1.07	0.82			5.36
Oct. 22	5.56	0.86	0.98	1.10	1.21	1.38	1.12	0.90	0.80	0.72	5.36
Oct. 25	7.57		0.72	0.90	1.12						7.29
Oct. 26	6.76	0.67	0.73	0.88	1.06	1.27					6.76
Oct. 27	6.27	0.81	0.94	1.04	1.22	1.43					8.48
Oct. 29	8.81		0.38	0.50	0.77						7.57
Means		**0.70**	**0.77**	**0.94**	**1.11**	**1.36**	**1.11**	**0.90**	**(0.74)**	**(0.65)**	
Departures		**−0.07**	**−0.07**	**−0.01**	**±0.00**	**−0.07**	**±0.00**	**−0.03**	**−0.06**	**−0.05**	

TABLE 1.—*Solar radiation intensities during October, 1927*—Con.

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.*
Oct. 3	8.18		0.97	1.12							7.57
Oct. 4	6.50		0.91				1.20				7.04
Oct. 8	5.79			1.09	1.24						6.76
Oct. 10	5.16			0.97	1.14	1.35					5.36
Oct. 14	4.57			1.09	1.29	1.54					5.56
Oct. 15	6.02			0.86	1.06						7.87
Oct. 17	4.75			1.20							4.37
Oct. 18	5.16		1.06	1.18		1.56	1.36				4.95
Oct. 19	4.95		0.92				1.14				6.50
Oct. 20	6.50				1.24		1.24				8.18
Oct. 21	4.57			1.22	1.36						4.37
Oct. 22	7.04			0.94	1.14		1.17				8.48
Oct. 24	7.57			1.01	1.16						7.87
Oct. 26	8.48			0.89	1.13		1.17				8.81
Oct. 27	8.18				1.12		1.09				10.59
Means			**0.96**	**1.05**	**1.19**	**1.48**	**1.20**				
Departures			**+0.03**	**−0.01**	**±0.00**	**+0.09**	**+0.01**				

LINCOLN, NEBR.

Oct. 3	7.87								1.04	0.90	7.29
Oct. 4	5.79						1.20	0.97	0.83	0.63	5.41
Oct. 7	6.02				1.27						5.36
Oct. 8	5.79		0.71	0.93	1.28	1.51	1.31	1.14	0.98	0.84	4.17
Oct. 9	4.57							1.18	0.98	0.89	4.75
Oct. 10	6.76	0.88	1.01	1.13	1.22	1.43					8.81
Oct. 13	3.81	1.09	1.15	1.27	1.41	1.55					3.99
Oct. 14	4.57	0.88	1.01	1.14	1.31	1.51					6.02
Oct. 15	6.27	0.87	1.00	1.12	1.25	1.40					6.76
Oct. 17	5.79		0.86	1.03	1.26		1.28	1.09	0.92	0.82	11.38
Oct. 18	4.95	0.72	0.87	1.03	1.23	1.47		1.06	0.91	0.81	5.79
Oct. 19	5.79		0.77	0.97	1.27						7.04
Oct. 20	6.50	0.71	0.75	0.97	1.23				0.96	0.86	5.56
Oct. 21	5.79		0.58	0.93	1.31		1.27	1.10	0.94	0.82	5.36
Oct. 22	6.27		0.95	1.05	1.22		1.23	1.06	0.93	0.81	5.16
Oct. 24	5.79	0.70	0.82	0.87	1.14		1.25				5.36
Oct. 26	6.76		0.92	1.04	1.23		1.18	1.00	0.87	0.77	7.57
Oct. 31	4.57		0.94		1.33						6.50
Means		**0.84**	**0.88**	**1.04**	**1.26**	**1.48**	**1.25**	**1.08**	**0.94**	**0.82**	
Departures		**−0.04**	**−0.07**	**−0.07**	**−0.02**	**−0.01**	**−0.01**	**−0.01**	**−0.01**	**−0.02**	

* Extrapolated.

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

[Gram-calories per square centimeter of horizontal surface]

Week beginning	Average daily radiation						Average daily departure from normal		
	Washington	Madison	Lincoln	Chicago	New York	Twin Falls	Washington	Madison	Lincoln
1927	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Oct. 1	374	175	268	195	297	454	+50	−93	−58
Oct. 8	256	242	373	165	223	440	−35	−9	+59
Oct. 15	241	317	385	228	150	410	−33	+91	+77
Oct. 22	296	264	316	221	232	286	+37	+58	+51
Deficiency since first of year on Oct. 28							−8,351	−4,032	−6,146

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. C. S. Freeman, Superintendent U. S. Naval Observatory]

[Data furnished by Naval Observatory, in cooperation with Harvard, Yerkes, and Mount Wilson observatories]

Date	Eastern standard civil time	Heliographic		Area [1]	
		Longitude	Latitude	Spot	Group
1927	*h. m.*	°	°		
Oct. 1 (Naval Observatory)	11 46	−76.0	+16.0	62	
		−73.0	−10.0	77	
		+46.0	−18.5		247
Oct. 2 (Naval Observatory)	11 45	−71.0	+15.5	123	
		−61.5	+16.0	108	
		−59.0	−9.5	77	
		+59.0	−18.5		185

[1] Areas are corrected for foreshortening and are expressed in millionths of the Sun's visible hemisphere.

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area	
		Longitude	Latitude	Spot	Group
1927	*h. m.*	°	°		
Oct. 3 (Harvard)	11 20	−80.0	+23.0	92	
		+48.0	+17.5	63	
		+63.5	−11.0	135	
		+70.0	−16.0		64
Oct. 3 (Mount Wilson)	15 0	−65.0	+18.0		181
		−46.0	+17.0	4	
		−43.0	−9.0	21	
		+12.0	+12.0		20
		+76.0	−18.0		145
Oct. 4 (Naval Observatory)	11 47	−82.0	−11.0		309
		−60.0	+19.0		154
		−52.0	+15.5		154
		−32.0	−10.0	37	
		+22.5	+10.0		40
Oct. 5 (Naval Observatory)	11 46	−78.0	−18.5		185
		−67.5	−11.0		185
		−49.0	+19.0		170
		−40.0	+15.5		62
		−19.0	−10.0	40	
		+19.5	+20.5		31
		+37.5	+9.5		31
Oct. 6 (Naval Observatory)	11 46	−63.5	−18.5		216
		−55.0	−11.5		231
		−37.0	+19.0		185
		−31.0	+17.5	31	
		−27.5	+15.0		77
		−6.5	−10.0	31	
		+51.5	+8.5	15	
Oct. 7 (Naval Observatory)	11 46	−69.5	+11.0	6	
		−52.0	−18.5		185
		−42.0	−11.5		123
		−22.5	+19.5		185
		−17.5	+17.5	6	
		−12.5	+16.0		62
		+8.0	−9.5	31	
		+12.0	−9.5		12
		+15.0	−9.5		22
		+62.5	+10.0		31
Oct. 8 (Yerkes)	11 31	−37.0	−18.0		200
		−24.0	−12.0		600
		−8.0	+19.0		150
Oct. 9 (Naval Observatory)	12 50	−67.0	−10.0		123
		−48.5	+18.0		31
		−25.5	−19.0		123
		−21.5	−21.0		6
		−11.0	−12.5		309
		+4.0	+19.5		185
		+9.0	+17.5		9
		+14.0	+15.5	31	
		+34.5	−10.0	22	
		+40.5	−9.5		31
		+46.0	−9.5		46
Oct. 10 (Naval Observatory)	11 46	−83.0	+21.0	247	
		−54.0	−9.5		216
		−12.0	−19.0		123
		−9.0	−20.5		15
		+2.5	−12.5		278
		+19.0	+18.0		154
		+60.5	−9.5	46	
Oct. 11 (Naval Observatory)	11 49	−71.5	+21.0	139	
		−39.5	−9.5		185
		+0.5	−20.0		139
		+15.5	−12.5		216
		+31.0	+18.0		93
		+72.0	−10.0		93
Oct. 12 (Mount Wilson)	14 0	−57.5	+20.5	120	
		−24.0	−10.0		424
		−7.5	+15.0		7
		+15.5	−20.5		113
		+31.0	−13.0		181
		+45.0	+19.0		40
Oct. 12 (Harvard)	12 10	−56.5	+22.0	166	
		−24.5	−8.0		430
		+12.5	−18.0	153	
		+30.5	−11.0		184
		+44.5	+19.0		108
Oct. 13 (Naval Observatory)	11 43	−45.5	+21.0	108	
		−20.0	−12.0		62
		−13.0	−11.0		123
		−9.0	−9.0	108	
		+26.0	−20.0		123
		+43.5	−12.5		154
		+54.0	+20.0		46
Oct. 14 (Naval Observatory)	11 44	−32.0	+21.0	93	
		−22.5	−20.0	6	
		+0.5	−11.0		93
		+5.5	−9.0	108	
		+39.5	−20.0		93
		+53.5	−12.0		46
		+62.0	−12.5	123	
		+70.5	+18.0	46	