SOLAR OBSERVATIONS

SOLAR AND SKY RADIATION MEASUREMENTS DURING NOVEMBER, 1927

By IRVING F. HAND, 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 November at Washington, D. C., and Lincoln, Nebr., but above normal at Madison, Wis.

Table 2 shows a deficiency 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 November normals for these stations.

Owing to cloudy conditions and snow on the ground, only a single polarization measurement was made at each station, Washington and Madison. The value 57 per cent obtained at Washington on the 26th is below normal for November, while the value of 73 per cent obtained on the 2d at Madison is above normal for that station.

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

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

Washington, D. C.

Date	Sun's zenith distance										
	8 a.m.	77.8°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	77.8°	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.*
Nov. 1	8.48				1.14						10.59
Nov. 5	4.37				1.32						4.17
Nov. 7	2.36			1.16							2.74
Nov. 14	4.17	0.72	0.85	0.98							6.76
Nov. 19	2.74			1.02							2.36
Nov. 25	5.56			0.90	1.09						6.02
Nov. 26	5.16			0.86							6.02
Means		(0.72)	(0.85)	0.98	1.18						
Departures		−0.03	±0.00	−0.01	±0.00						

Madison, Wis.

Nov. 2	3.30		1.12	1.00			1.39	1.20			3.15
Nov. 12	2.49	1.01	1.14	1.28	1.42	1.57					1.37
Means		(1.01)	(1.13)	(1.14)	(1.42)	(1.57)	(1.39)	(1.20)			
Departures		+0.13	+0.11	−0.01	+0.12	+0.05	+0.04	+0.04			

Lincoln, Nebr.

Nov. 3	3.99	0.78	0.97	1.18							4.17
Nov. 16	1.88		1.00	1.16	1.36	1.60	1.31	1.12	0.97	0.85	1.96
Nov. 24	2.87		1.03	1.19							2.87
Nov. 25	3.63		1.03	1.19	1.27						3.45
Nov. 27	3.45							1.09	0.94		3.99
Nov. 28	4.37							1.19	1.01	0.81	3.43
Nov. 30	2.49							1.25	1.03		1.37
Means		(0.78)	1.01	1.18	(1.32)	(1.60)	(1.31)	1.16	0.99	(0.83)	
Departures		−0.15	−0.02	−0.01	−0.03	+0.02	−0.05	−0.03	−0.06	−0.10	

* 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. 29	234	166	220	132	160	259	−4	±0	−24
Nov. 5	173	112	158	73	104	169	−44	−38	−67
Nov. 12	190	110	160	76	143	131	−5	−15	−36
Nov. 19	204	69	151	50	114	136	+22	−48	−47
Nov. 26	148	128	204	56	61	104	−7	+16	+14
Deficiency since first of year on Dec. 2							−8,722	−4,627	−7,266

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.*	°	°		
Nov. 1 (Naval Observatory)	11 45	−57.0	+18.0		139
		−45.0	−12.0		77
		−41.0	+15.5		62
		+30.0	+17.5		62
		+35.0	+15.0		46
		+38.0	+10.5		108
		+43.5	−17.0		31
Nov. 2 (Naval Observatory)	14 36	−42.0	+18.0	108	
		−29.5	−12.0		62
		−26.0	+15.5	6	
		+48.0	+17.5		31
		+54.5	+10.5		62
Nov. 4 (Naval Observatory)	14 14	−16.0	+17.5		77
		−1.5	+17.0		46
		+30.0	+21.5		15
Nov. 5 (Naval Observatory)	11 38	−2.0	+18.0		77
		+11.5	+17.0		31
		+27.0	+18.0	15	
		+43.0	+22.0		62
Nov. 6 (Naval Observatory)	11 43	−55.5	−10.0		31
		+13.0	+18.0		46
		+25.5	+16.0		46
		+58.0	+21.0		62
Nov. 7 (Naval Observatory)	11 45	−39.5	−10.0		31
		+24.5	+18.5		31
		+70.5	+21.0		31
Nov. 9 (Naval Observatory)	11 54	−82.0	−8.0		278
		−71.0	+14.5	62	
		−30.5	+6.0		31
		−15.0	−11.0		154
		−9.5	−10.0		278
		+32.0	−11.5		46
Nov. 11 (Naval Observatory)	11 41	−68.0	+6.5		93
		−64.0	+7.5		108
		−59.0	+7.0		93
		−59.0	−7.0		93
		−54.0	−7.5	216	
		−53.5	−9.0		77
		−27.5	−11.5		31
		−3.0	+7.5		15
		+12.0	−10.0		278
		+17.5	−10.0		617
		+58.0	−11.5		31

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

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area	
		Longitude	Latitude	Spot	Group
	h. m.	°	°		
Nov. 12 (Naval Observatory)	11 51	−57.0	+6.5		93
		−47.5	+8.5		93
		−47.5	−6.0		46
		−45.0	+5.0	31	
		−40.5	−7.5		278
		−11.0	−12.0	6	
		+9.5	+8.0		31
		+24.0	−10.5		278
		+31.0	−10.0		679
Nov. 13 (Naval Observatory)	11 45	−42.5	+6.5		93
		−37.5	+8.5		46
		−31.5	+5.0		46
		−31.0	−7.0		77
		−30.0	+9.5		31
		−27.5	−7.5	216	
		−24.5	−9.0	31	
		+38.5	−9.5		340
		+42.0	−8.5		185
		+47.0	−10.0		370
Nov. 14 (Naval Observatory)	11 46	−30.0	+5.5	31	
		−22.5	+8.5		77
		−18.5	+9.0		46
		−17.0	−7.5		77
		−13.0	−7.5	185	
		−9.5	−9.0		6
		+42.5	−12.0	6	
		+53.0	−9.5		340
		+60.0	−10.0		432
Nov. 15 (Naval Observatory)	11 45	−17.0	+5.5	15	
		−9.5	+8.5		154
		−5.0	+9.0		62
		−3.5	−7.0		108
		+0.5	−7.5	216	
		+65.5	−10.0		247
		+69.0	−8.0	46	
		+73.0	−10.0		340
Nov. 16 (Naval Observatory)	12 11	−77.0	+11.5		46
		−72.5	+10.5		154
		−29.0	−20.5		37
		−2.0	+5.5	22	
		+4.0	+8.5		77
		+8.0	+9.0		62
		+12.5	−7.5		340
		+70.0	+11.0	62	
		+80.0	−10.5		309
Nov. 18 (Naval Observatory)	12 24	−76.0	−13.5	31	
		−48.5	+10.5		62
		−43.0	+11.0		154
		−0.5	−20.5	62	
		+24.5	+5.5	9	
		+31.5	+8.0		46
		+36.0	+9.0		31
		+40.0	−8.0		278
		+40.5	−10.5	62	
		+75.0	−19.0	77	
Nov. 19 (Naval Observatory)	11 42	−63.0	−15.5		123
		−36.0	+11.0		62
		−30.5	+10.5		231
		−12.0	−6.5		62
		+11.5	−20.5	46	
		+52.5	−8.0		216
Nov. 20 (Naval Observatory)	11 43	−51.5	−13.5		216
		−21.0	+10.0		15
		−17.5	+10.5		139
		+3.0	−7.5		15
		+24.0	−20.5		37
		+27.0	+13.0		15
		+65.0	−8.0		154
Nov. 22 (Naval Observatory)	11 36	−25.5	−14.0		185
		+7.5	+10.5		15
		+11.0	+10.5		123
		+31.0	−7.5		108
		+50.5	−20.0	40	
		+56.0	+13.0	15	
Nov. 23 (Naval Observatory)	11 29	−26.0	−14.5		123
		−23.0	−17.5		93
		−14.0	−14.0		108
		−10.5	−15.0	31	
		+21.0	+12.0		62
		+23.5	+10.5		108
		+40.0	−7.0	62	
		+48.5	−7.5	46	
		+63.5	−20.0	15	

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area	
		Longitude	Latitude	Spot	Group
	h. m.	°	°		
Nov. 24 (Naval Observatory)	11 54	−17.5	+17.5		15
		−13.5	−15.0		170
		−13.0	−18.0		31
		−8.0	−17.5		170
		−0.5	−15.0		46
		+3.0	−15.0	31	
		+33.5	+12.0		31
		+37.5	+10.5		123
		+53.5	−6.5		77
		+57.5	−7.0	9	
		+62.0	−7.5	31	
Nov. 26 (Naval Observatory)	11 43	−74.0	+5.0	6	
		−52.5	−20.0	9	
		−45.0	−16.5	15	
		+10.0	−18.0	139	
		+16.0	−17.5		340
		+27.0	−15.0		46
		+30.5	−15.0	31	
		+67.0	+11.0	123	
		+80.0	−7.0	62	
Nov. 27 (Naval Observatory)	11 31	−62.0	+4.5	31	
		−40.0	−20.0	6	
		+22.0	−18.0	123	
		+26.5	−16.5		216
		+31.0	−18.0		247
		+40.5	−15.0		15
		+44.0	−15.0	9	
		+79.0	+10.5	93	
Nov. 29 (Naval Observatory)	12 43	−34.5	+5.0	6	
		−0.5	−14.5		62
		+48.5	−18.0	108	
		+54.0	−16.5		278
		+59.5	−17.5	370	
Nov. 30 (Naval Observatory)	11 21	+12.5	−14.5		77
		+30.0	−10.0	15	
		+61.0	−18.0	93	
		+66.0	−16.5		247
		+72.0	−17.5	463	

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR NOVEMBER, 1927 [1]

[Data supplied by Prof. A. Wolfer, Zurich, Switzerland]

November	Relative numbers	November	Relative numbers
1	65	16	
2	56	17	92
3	32	18	84
4	25	19	67
5		20	
6	36	21	82
7		22	
8	15	23	81
9	49	24	
10	74	25	92
11		26	72
12	106	27	69
13	113	28	
14	103	29	
15	91	30	

Number of observations, 20; mean, 70.2.