SOLAR OBSERVATIONS

SOLAR RADIATION OBSERVATIONS DURING SEPTEMBER 1937

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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 above normal for September at Washington, close to normal at Blue Hill, and below normal at Lincoln and Madison.

Table 2 shows an excess in the amount of total solar and sky radiation received on a horizontal surface at all stations with the exception of Twin Falls, Miami, Riverside, Friday Harbor, and Ithaca.

Polarization measurements made at Madison on 9 days give a mean of 53 percent with a maximum of 60 percent on the 13th. Both of these values are below the corresponding September normals for that station.

TABLE 1.—*Solar radiation intensities during September 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.*
Sept. 1	18.59	0.83	0.92	1.02	1.10						16.79
Sept. 2	19.23	.60	.72	.82	.95						17.96
Sept. 8	13.13	.66	.75	.84	1.08						10.97
Sept. 10	13.61		.94	1.03	1.17	1.38					9.47
Sept. 14	7.32	.74	.80	.93	1.18						7.04
Sept. 15	10.59		.87	.98	1.14	1.40	1.16	0.97			10.21
Sept. 18	6.50	.91	1.02	1.13	1.24	1.49					5.56
Sept. 20	6.27	.91	.99	1.15	1.30	1.46	1.14	.97	0.84		6.02
Sept. 23	10.21		.70	.78	.93						10.97
Sept. 24	11.38				1.17	1.46					12.68
Sept. 25	10.59			.91	1.17	1.38					12.24
Sept 30	8.48			.68	.95						7.87
Means		.78	.86	.93	1.12	1.43	(1.15)	(.97)	(.84)		
Departures		+.08	+.10	+.06	+.07	+.11	+.08	+.10	+.09		

MADISON, WIS.

Sept. 2	19.23		.69	.86	1.03						18.59
Sept. 3	17.86					1.30					18.59
Sept. 7	9.83	.68	.76								10.59
Sept. 9	10.59		.61	.78	1.00	1.30					9.83
Sept. 11	9.83	.91	1.00	1.12	1.28	1.42					8.18
Sept. 13	7.29		.92		1.31						6.50
Sept. 16	5.79	.98	1.08	1.20	1.36	1.56					4.75
Sept. 21	5.79		.57	.75	.95						8.18
Sept. 22	11.38		.57	.75	.99						11.81
Sept. 23	12.68	.49	.60	.79	.97						14.60
Sept. 27	4.75	.60	.76	.89	1.14	1.39					4.57
Means		.73	.76	.89	1.11	1.39					
Departures		−.09	−.13	−.13	−.05	−.01					

[1] Extrapolated

TABLE 1.—*Solar radiation intensities during September 1937*—Con.

LINCOLN, NEBR.

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.*
Sept. 2	14.60	0.71	0.86	1.00	1.24	1.45	1.22	1.02	0.89	0.77	10.97
Sept. 3	14.60	.76	.87	1.03	1.16						14.10
Sept. 10	13.13						1.29	1.09	.99	.88	9.47
Sept. 11	9.14	.80	.93	1.02	1.27	1.49					9.14
Sept. 13	6.76		.93	1.08	1.26	1.49					6.76
Sept. 14	9.47	.78	.90	.95	1.19						8.81
Sept. 15	6.50				1.14	1.46	1.15	.93	.72	.64	5.79
Sept. 17	5.16			.73	1.02		1.09	.85	.69	.56	4.57
Means		.76	.90	.97	1.18	1.47	1.19	.97	.82	.71	
Departures		−.16	−.12	−.19	−.18	−.06	−.16	−.17	−.18	−.20	

BLUE HILL, MASS.

Sept. 4	18.2				0.99	1.22					19.1
Sept. 6	7.6			1.10	1.28	1.50	1.20				7.6
Sept. 7	8.6	0.81	0.92	1.05	1.23	1.42					7.3
Sept. 8	9.6		.90	1.02	1.22	1.46	1.17	1.03	0.91		8.6
Sept. 9	7.6	.92	1.03	1.13	1.24	1.37	1.19	1.02	.87	0.74	8.6
Sept. 10	9.6	.84	.94	1.05	1.20	1.43	1.24	1.13	1.03	.93	11.1
Sept. 12	11.9	.74	.86	.99	1.18	1.44					10.5
Sept. 14	9.2					1.50	1.20	1.06	.96	.86	7.8
Sept. 15	10.5	.62	.72	.93	1.04	1.34	.97	.77	.65	.56	10.2
Sept. 18	6.8	.82	.93	1.05	1.19	1.32	1.21	1.10	1.00		6.6
Sept. 20	6.1	.97	1.03	1.10	1.23	1.44	1.25	1.14	1.04	.94	6.2
Sept. 21	5.6	.98	1.04	1.14	1.26	1.50	1.16	1.09	.97	.86	5.4
Sept. 22	7.4	.86	.97	1.09	1.30	1.50	.90	.73	.67	.61	7.5
Sept. 23	9.3	.79	.90	1.04	1.20	1.34	.97	.87	.72	.59	9.5
Sept. 24	11.1	.40	.51	.65	.90	1.19					13.7
Sept. 26	13.2				1.06						12.2
Sept. 30	6.8				1.12	1.39					5.2
Means		.80	.90	1.03	1.16	1.40	1.13	.99	.88	.76	
Departures		−.01	−.02	−.01	−.02	+.03	.00	+.04	+.02	.00	

LATE DATA

BLUE HILL, MASS.

Aug. 2	13.7				0.89	1.28	0.80				11.2
Aug. 3	12.7				.99	1.32	1.29	1.08			10.8
Aug. 4	13.7				.97	1.31	.86	.64			11.3
Aug. 7	19.5					1.33	1.10				18.2
Aug. 11	19.7					1.30	1.16				19.1
Aug. 13	16.4					1.21	1.14				12.3
Aug. 14	11.5					1.40	1.17	1.06	0.96	0.86	9.3
Aug. 15	11.1	0.93	1.03	1.15	1.29	1.49	1.17	.99	.80	.70	9.4
Aug. 16	12.8		.69	.85	1.05	1.28	.83	.64	.57	.51	15.1
Aug. 17	16.4	.68	.73	.85	1.05	1.28					15.7
Aug. 28	16.4					1.26	.96	.80	.70	.56	22.0
Aug. 29	14.7	.71	.80	.90	1.06	1.27	.94				18.0
Aug. 31	18.8				.96	1.09					15.8
Means		.77	.81	.94	1.03	1.29	1.04	.87	.76	.66	
Departures		+.02	−.01	−.01	−.04	+.02	−.04	−.07	+.04	−.01	

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.*
Sept. 3	341	486	361	378	372	605	251	493	536	400	352	501	456	630	437	377	427
Sept. 10	456	434	485	376	368	543	183	469	497	388	385	464	353	613	391	234	340
Sept. 17	413	447	472	406	340	531	224	362	390	452	307	407	394	631	291	331	421
Sept. 24	296	291	382	278	305	481	145	401	314	235	411	381	319	513	183	327	315
	Departures from weekly normals																
Sept. 3	−40	+107	−93	+37	+54	+31	+55	+17	--------	−31	−61	−5	0	--------	+7	+38	--------
Sept. 10	+87	+95	+55	+76	+51	−2	−27	+14	--------	−32	+51	−3	−87	--------	+36	−99	--------
Sept. 17	+44	+100	+48	+87	+38	+135	+66	−46	--------	+19	−1	−14	−29	--------	−35	+1	--------
Sept. 24	−54	−1	+8	+12	+25	+114	+19	−28	--------	−150	+53	−34	−81	--------	−146	+25	--------
	Accumulated departures on—																
	+2,261	+8,050	+3,808	+5,334	+6,118	+7,833	+1,428	+336	--------	−9,184	+4,935	−3,780	−2,709	--------	−1,617	−4,676	--------

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.*		°	°	°				
Sept. 1	11 27	5540	−60.0	194.4	+19.0	------	242	------	U. S. Naval.
		5543	−60.0	194.4	−11.0	------	24	------	
		5542	−34.0	220.4	+6.5	------	48	------	
		5538	−17.0	237.4	+30.0	------	436	------	
		5536	+31.0	285.4	−12.5	------	73	------	
		5533	+75.0	329.4	+13.0	------	48	------	
		5522	+86.0	340.4	+33.0	------	485	1,356	
Sept. 2	11 8	5540	−51.0	190.4	+14.0	6	------	------	Do.
		5540	−48.0	193.4	+19.0	------	242	------	
		5543	−48.0	193.4	−12.0	16	------	------	
		5538	−4.0	237.4	+29.5	------	339	------	
		5542	+21.0	262.4	+6.5	------	36	------	
		5545	+40.5	281.9	+6.0	------	12	------	
		5536	+43.0	284.4	−14.0	------	194	845	
Sept. 3	10 59	5548	−79.0	149.2	+10.0	339	------	------	Do.
		5540	−40.0	188.2	+14.0	------	12	------	
		5540	−35.0	193.2	+19.0	------	242	------	
		5543	−34.0	194.2	−12.0	16	------	------	
		5538	+3.0	231.2	+32.5	------	145	------	
		5538	+11.0	239.2	+27.0	------	170	------	
		5546	+12.0	240.2	−8.0	12	------	------	
		5545	+52.0	280.2	+6.0	12	------	------	
		5536	+59.0	287.2	−14.0	------	218	1,166	
Sept. 4	9 5	5548	−67.0	149.1	+10.5	436	------	------	Mt. Wilson.
		5540	−27.0	189.1	+13.0	------	12	------	
		5540	−23.0	193.1	+18.5	------	145	------	
		5543	−21.5	194.6	−12.0	12	------	------	
		5549	−2.5	213.6	−10.0	------	24	------	
		5538	+15.0	231.1	+33.0	------	121	------	
		5538	+24.0	240.1	+27.0	------	145	------	
		5545	+64.0	280.1	+6.0	12	------	------	
		5536	+70.0	286.1	−14.0	------	145	1,052	
Sept. 5	9 35	5548	−66.0	136.6	+11.0	36	------	------	Do.
		5548	−53.0	149.6	+11.0	------	436	------	
		5540	−11.0	191.6	+13.0	------	48	------	
		5540	−9.0	193.6	+18.5	------	97	------	
		5549	+12.5	215.1	−11.0	------	48	------	
		5538	+28.5	231.1	+33.0	------	48	------	
		5538	+35.0	237.6	+27.0	------	97	810	
Sept. 6	9 15	5551	−82.0	107.6	+13.5	4	8	------	Do.
		5548	−52.0	137.6	+11.0	------	48	------	
		5548	−39.0	150.6	+11.0	------	436	------	
		5540	+2.0	191.6	+13.0	------	48	------	
		5540	+4.0	193.6	+18.5	------	73	------	
		5543	+5.0	194.6	−13.0	------	12	------	
		5549	+20.5	210.1	−10.0	------	18	------	
		5550	+21.0	210.6	+10.5	------	194	------	
		5538	+43.0	232.6	+34.0	------	48	------	
		5538	+51.0	240.6	+27.0	------	73	998	
Sept. 7	15 16	5551	−68.0	105.1	+12.0	------	436	------	U. S. Naval,
		5553	−50.5	122.6	+19.0	36	------	------	
		5552	−43.0	130.1	+10.0	------	48	------	
		5548	−34.0	139.1	+10.0	------	73	------	
		5548	−22.0	151.1	+11.0	------	485	------	
		5540	+21.0	194.1	+18.0	------	48	------	
		5550	+38.0	211.1	+10.5	------	170	1,296	

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.*		°	°	°				
Sept. 8	11 2	5551	−56.0	106.2	+12.0	------	727	------	Do.
		5553	−39.5	122.7	+19.0	------	73	------	
		5552	−32.0	130.2	+10.0	------	97	------	
		5548	−22.0	140.2	+9.5	------	73	------	
		5548	−11.0	151.2	+10.0	------	485	------	
		5540	+33.0	195.2	+18.0	------	48	------	
		5550	+50.0	212.2	+10.0	------	194	1,697	
Sept. 9	11 4	5551	−43.0	106.0	+12.0	------	582	------	Do.
		5553	−26.0	123.0	+19.5	------	85	------	
		5552	−19.0	130.0	+10.0	------	97	------	
		5548	−9.0	140.0	+9.5	------	73	------	
		5548	+2.0	151.0	+10.5	------	485	------	
		5540	+45.0	194.0	+17.0	------	24	------	
		5550	+63.0	212.0	+8.0	------	436	1,782	
Sept 10	11 7	5551	−30.0	105.7	+12.0	------	485	------	Do.
		5554	−11.0	124.7	−11.0	------	145	------	
		5553	−10.0	125.7	+19.0	------	61	------	
		5552	−5.0	130.7	+10.0	------	194	------	
		5548	+5.0	140.7	+9.5	------	73	------	
		5548	+15.0	150.7	+10.5	------	533	------	
		5540	+58.0	193.7	+13.5	------	24	------	
		5550	+76.0	211.7	+8.0	------	485	2,000	
Sept. 11	12 26	(1)	−51.5	70.3	+11.0	12	------	------	Do.
		5551	−16.0	105.8	+12.0	------	388	------	
		5554	+3.5	125.3	−10.5	------	97	------	
		5553	+3.5	125.3	+19.0	------	73	------	
		5552	+9.5	131.3	+11.0	------	436	------	
		5548	+21.0	142.8	+9.5	------	24	------	
		5548	+29.0	150.8	+10.5	------	776	1,806	
Sept. 12	12 31	5556	−80.0	28.6	+17.5	145	------	------	Do.
		5555	−78.0	30.6	+12.0	------	291	------	
		5551	−2.0	106.6	+13.0	------	242	------	
		5553	+18.5	127.1	+19.0	------	48	------	
		5554	+19.0	127.6	−12.0	------	61	------	
		5552	+24.0	132.6	+12.0	------	485	------	
		5548	+33.0	141.6	+9.5	------	12	------	
		5548	+43.0	151.6	+10.5	------	776	2,060	
Sept. 13	11 10	5556	−69.0	27.1	+18.0	145	------	------	Do.
		5555	−66.0	30.1	+13.0	------	339	------	
		5551	+11.0	107.1	+13.0	------	242	------	
		5554	+29.5	125.6	−11.0	------	61	------	
		5553	+31.0	127.1	+20.0	36	------	------	
		5552	+36.0	132.1	+12.0	------	970	------	
		5548	+48.0	144.1	+9.5	24	------	------	
		5548	+56.0	152.1	+11.0	------	679	2,496	
Sept. 14	11 14	5557	−65.0	17.9	−20.5	48	------	------	Do.
		5556	−56.0	26.9	+18.0	48	------	------	
		5555	−53.0	29.9	+13.0	------	242	------	
		5551	+24.0	106.9	+13.0	------	97	------	
		5553	+44.0	126.9	+20.0	24	------	------	
		5552	+50.0	132.9	+12.0	------	1454	------	
		5548	+60.0	142.9	+10.0	24	------	------	
		5548	+69.0	151.9	+12.0	------	679	2616	
Sept. 15	11 6	5557	−50.0	19.7	−20.0	61	------	------	Do.
		5556	−46.0	23.7	+15.0	------	97	------	
		5555	−38.0	31.7	+12.0	------	194	------	
		5551	+39.0	108.7	+11.0	------	73	------	
		5553	+58.0	127.7	+19.0	24	------	------	
		5552	+64.0	133.7	+11.0	------	1309	------	
		5548	+85.0	154.7	+11.0	582	------	2,340	

[1] Not numbered.