SOLAR RADIATION AND SUNSPOT DATA FOR DECEMBER 1944

[Solar Radiation Investigations Section, I. F. HAND, in charge]

SOLAR RADIATION OBSERVATIONS

EXPLANATIONS of the tables and references to descriptions of instruments, stations, and methods of observation, and to summaries of data, are given in the January 1944 REVIEW, page 43. A list of the pyrheliometric stations also is given on page 45 of the same REVIEW.

Eight stations had less than average solar radiation for 1944, while four received more than normal insolation during the same period. Mr. R. A. Dyke, Official in Charge of the Weather Bureau Office at Lincoln, attributes the rather large minus departure at his station to less than normal sunshine. Almost unquestionably the transfer of the radiation equipment from the University Experiment Station to the heart of the business district also is a contributing cause of the diminished radiation receipt.

TABLE 1.—*Solar radiation intensities during December 1944*

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

MADISON, WIS.

Date	Sun's zenith distance										
	7:30 a. m.	78.7°	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									Local mean solar time
		A. M.				*1.0	P. M.				
	e	5.0	4.0	3.0	2.0		2.0	3.0	4.0	5.0	e
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
Dec. 2	1.6	0.90	1.11	1.18	------	1.48	------	1.16	------	------	2.7
Dec. 12	2.6	.75	1.02	1.19	------	1.61	------	------	------	------	3.0
Dec. 14	1.4	.71	.84	1.07	------	------	------	------	------	------	2.6
Dec. 15	3.5	.74	.91	.99	------	------	------	------	------	------	5.1
Dec. 19	1.7	.88	.90	1.15	------	1.45	------	------	------	------	2.9
Dec. 21	1.0	.98	1.13	1.24	------	1.61	------	------	------	------	1.0
Dec. 23	1.9	.76	.94	1.06	------	------	------	------	------	------	1.0
Dec. 26	0.4	.69	.94	1.10	------	1.58	------	------	------	------	1.1
Means	------	.80	.97	1.12	------	1.55	------	(1.16)	------	------	------
Departures	------	−.13	−.09	−.08	------	+.01	------	−.04	------	------	------

LINCOLN, NEBR.

Dec. 1	1.0	------	------	0.47	------	------	------	1.16	0.98	0.81	2.7
Dec. 5	5.3	------	------	------	------	------	------	.94	.83	.70	5.3
Dec. 6	4.6	------	0.83	1.05	------	------	------	------	------	------	6.6
Dec. 7	5.6	0.96	1.09	1.22	------	------	------	1.20	1.05	.83	5.3
Dec. 10	3.5	------	------	------	------	------	------	1.18	1.05	.94	3.3
Dec. 13	3.2	------	1.21	1.27	------	------	------	1.22	1.09	1.01	3.5
Dec. 14	4.2	.90	.98	1.16	------	------	------	1.20	1.01	------	5.6
Dec. 16	3.5	.98	1.13	1.22	------	------	------	1.27	1.07	.94	4.4
Dec. 18	2.2	.77	.96	1.11	------	------	------	1.18	1.03	.92	4.2
Dec. 21	2.2	------	------	1.09	------	------	------	------	------	------	2.1
Dec. 26	1.4	.96	1.05	1.16	------	------	------	------	------	------	1.7
Dec. 27	3.2	.96	1.07	1.22	------	------	------	1.27	1.05	------	3.7
Means	------	.92	1.04	1.10	------	------	------	1.18	1.02	.88	------
Departures	------	−.04	−.05	−.13	------	------	------	−.01	−.04	−.07	------

TABLE 1.—*Solar radiation intensities during December 1944*—Con.

ALBUQUERQUE, N. MEX.

Date	Sun's zenith distance										
	7:30 a. m.	78.7°	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									Local mean solar time
		A. M.				*1.0	P. M.				
	e	5.0	4.0	3.0	2.0		2.0	3.0	4.0	5.0	e
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
Dec. 6	2.6	------	------	------	------	------	------	------	1.09	0.95	3.8
Dec. 7	3.4	1.00	1.08	1.22	1.38	------	1.41	1.31	1.22	1.19	4.0
Dec. 8	3.2	1.01	1.11	1.18	------	------	1.41	1.33	1.16	------	4.0
Dec. 10	2.3	1.14	------	1.34	1.46	------	1.42	1.33	1.28	1.25	1.8
Dec. 11	1.5	.94	1.05	1.12	1.34	------	1.37	------	------	------	1.9
Dec. 12	2.9	.88	1.02	1.14	1.30	------	1.33	1.22	1.14	1.11	2.2
Dec. 13	2.1	1.00	1.08	1.24	1.41	------	1.42	1.22	1.22	1.21	2.3
Dec. 14	2.3	.99	1.11	1.21	1.39	------	1.42	1.31	1.32	1.30	2.5
Dec. 16	2.5	.98	1.06	1.19	1.37	------	1.35	1.33	1.30	1.27	3.2
Dec. 17	2.9	1.05	1.14	1.22	1.36	------	1.22	1.29	1.24	1.21	2.5
Dec. 18	2.6	1.02	1.13	1.24	1.40	------	1.41	1.28	1.17	1.07	2.9
Dec. 19	1.8	1.00	1.07	1.24	1.33	------	1.31	1.15	1.06	------	3.4
Dec. 20	1.9	------	------	1.08	1.28	------	1.32	1.27	1.18	1.13	2.6
Dec. 21	2.6	------	------	1.16	1.33	------	1.38	1.28	1.24	1.21	3.6
Dec. 22	2.6	------	1.01	------	1.31	------	1.33	------	------	------	3.3
Dec. 27	4.2	------	------	------	------	------	1.37	1.14	.89	------	4.4
Dec. 29	4.0	1.06	1.12	1.24	1.39	------	1.40	1.36	1.31	1.27	4.0
Dec. 30	3.3	.90	1.05	1.20	------	------	------	1.41	1.37	1.35	4.2
Dec. 31	4.4	------	------	1.11	1.42	------	1.47	1.48	1.46	1.44	3.2
Means	------	1.00	1.08	1.20	1.36	------	1.31	1.29	1.21	1.21	------
Departures	------	−.04	−.05	−.05	−.04	------	−.09	+.02	+.05	+.11	------

BOSTON, MASS.

Dec. 4	2.7	0.75	0.78	0.92	------	------	------	0.69	0.83	0.64	3.5
Dec. 5	3.0	.92	.99	1.01	------	------	------	.84	.42	------	3.3
Dec. 7	4.8	.46	.71	.77	------	------	------	.60	.34	.18	6.4
Dec. 9	7.4	.82	------	.96	------	------	------	------	------	------	5.6
Dec. 11	3.8	.53	.38	------	------	------	------	------	------	------	4.4
Dec. 14	2.6	------	------	1.10	------	------	------	------	------	------	3.1
Dec. 15	2.7	.80	1.02	.98	------	------	------	1.04	1.02	.83	3.1
Dec. 20	1.8	.50	------	------	------	------	------	------	------	------	2.7
Dec. 28	4.2	.72	.85	1.03	------	------	------	------	.96	------	4.0
Means	------	.69	.79	.97	------	------	------	.79	.71	.55	------

BLUE HILL, MASS.

Dec. 2	2.5	------	------	------	------	------	------	------	1.07	------	1.7
Dec. 3	1.6	0.95	1.04	1.20	------	------	------	1.00	.93	0.80	1.9
Dec. 4	2.5	.91	------	------	------	------	------	------	------	------	3.3
Dec. 5	2.4	1.01	1.10	1.18	------	------	------	------	------	------	1.3
Dec. 7	4.6	.67	.80	.93	------	------	------	.88	.76	.68	4.8
Dec. 10	3.8	.70	.79	------	------	------	------	------	------	------	4.0
Dec. 11	3.6	.76	.95	1.00	------	------	------	------	------	------	3.8
Dec. 14	2.6	------	------	1.21	1.38	------	------	1.20	1.08	.97	2.4
Dec. 15	2.6	.91	1.14	1.27	1.40	------	------	1.21	1.02	.93	2.9
Dec. 22	1.2	------	------	------	------	------	------	1.12	.86	.72	1.1
Dec. 26	3.8	------	------	------	------	------	1.40	1.25	1.14	1.03	1.9
Dec. 28	3.6	.88	------	1.12	1.31	------	------	------	------	.88	2.9
Dec. 29	1.1	------	------	1.28	------	------	------	1.27	1.13	1.01	1.0
Dec. 30	1.2	.97	1.06	1.17	------	------	------	------	------	------	2.5
Means	------	.86	.98	1.15	1.36	------	(1.40)	1.13	1.00	.88	------
Departures	------	−.03	−.06	−.02	+.01	------	+.10	−.01	−.03	−.08	------

Ratio, Boston/Blue Hill on comparable dates

	------	0.81	0.78	0.86	------	------	------	0.79	0.76	0.62	------

*Extrapolated.

TABLE 2.—*Daily totals and weekly means of solar radiation (direct+diffuse) received on horizontal surface*

[Gram-calories per square centimeter]

Date 1944	Washington, D. C.	Madison, Wis.	Lincoln, Nebr.	East Lansing, Mich.	New York, N. Y.	Fresno, Calif.	Fairbanks, Alaska	Columbia, Mo.	Boston, Mass.	Nashville, Tenn.	Twin Falls, Idaho	La Jolla, Calif.	Riverside, Calif.	Blue Hill, Mass.	Ithaca, N. Y.	Newport, R. I.	State College, Pa.	Put-in-Bay, Ohio	East Wareham, Mass.	Davis, Calif.	Boulder, Colo.	Tooele, Utah	Illumination—Boston, Mass.
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*Avg. ft. candles*
Dec. 3	263	86	8	163	242	106	0	79	173	263	168	289	330	203	------	188	258	183	42	273	186	156	1,522
Dec. 4	264	73	12	77	216	254	0	75	159	155	151	289	347	191	203	157	252	129	61	250	190	288	1,464
Dec. 5	249	40	157	72	205	257	0	22	141	140	155	293	307	191	201	194	219	134	231	253	225	294	1,381
Dec. 6	186	74	215	35	89	245	0	70	72	53	178	291	296	174	77	176	84	71	206	256	218	303	706
Dec. 7	113	124	215	43	160	193	4	65	119	17	182	282	285	171	156	178	116	52	192	241	165	293	1,123
Dec. 8	31	122	177	26	10	102	0	130	30	206	41	171	222	41	18	40	13	51	51	194	209	273	343
Dec. 9	160	63	56	34	158	86	5	40	142	133	169	267	232	172	151	188	95	67	230	168	162	315	1,419
Mean	**181**	**83**	**120**	**64**	**154**	**177**	**1**	**69**	**120**	**138**	**149**	**269**	**289**	**163**	**134**	**160**	**148**	**98**	**145**	**234**	**194**	**274**	**1,137**
Departure	**+20**	**−33**	**−53**	**−19**	**+27**	**−11**	**−6**	------	------	**+17**	**+24**	**+25**	**+70**	**+23**	**+34**	**+17**	**+27**	**−12**	**−3**	**+42**	------	------	------
Dec. 10	228	55	150	59	99	152	0	47	134	69	194	271	282	162	139	190	71	120	219	164	259	320	1,290
Dec. 11	37	83	206	34	104	208	0	74	82	55	188	214	156	157	52	139	26	16	155	220	172	308	805
Dec. 12	107	220	112	169	16	184	0	242	53	59	184	276	294	57	54	38	101	136	145	207	232	303	606
Dec. 13	251	220	225	78	195	232	2	151	162	80	201	257	259	188	74	141	158	48	231	160	224	306	1,503
Dec. 14	188	177	220	122	195	150	6	251	169	199	195	107	108	207	167	207	111	73	229	109	221	295	1,464
Dec. 15	245	150	85	88	151	206	1	209	158	243	189	213	270	211	158	201	191	126	231	228	220	276	1,382
Dec. 16	145	191	214	72	45	241	0	172	56	154	157	252	256	80	55	83	80	71	93	232	217	255	583
Mean	**172**	**157**	**173**	**89**	**115**	**196**	**1**	**164**	**116**	**123**	**187**	**227**	**232**	**152**	**99**	**143**	**105**	**84**	**186**	**189**	**220**	**295**	**1,090**
Departure	**+31**	**+40**	**+13**	**−10**	**−1**	**+25**	**−4**	------	------	**−12**	**+60**	**−12**	**+32**	**+15**	**−20**	**−3**	**−15**	**−36**	**+29**	**+21**	------	------	------
Dec. 17	244	142	144	33	179	160	2	170	108	247	129	230	222	148	160	147	186	117	161	177	128	288	1,074
Dec. 18	131	207	206	123	101	199	1	208	139	7	132	257	284	186	153	131	63	137	151	60	219	252	1,318
Dec. 19	236	218	152	105	211	85	0	230	38	219	126	216	236	66	206	66	163	150	55	22	209	242	392
Dec. 20	114	118	144	82	112	230	0	192	128	239	44	266	278	177	85	172	150	155	185	204	175	102	1,248
Dec. 21	78	235	220	119	56	82	4	230	82	60	138	162	212	100	106	66	95	151	72	27	213	261	811
Dec. 22	161	81	190	141	156	98	7	233	141	59	50	113	38	205	208	211	224	211	227	130	94	105	1,129
Dec. 23	134	224	152	74	32	211	1	58	45	30	96	217	170	74	84	37	161	40	82	178	203	126	458
Mean	**157**	**175**	**173**	**97**	**121**	**152**	**2**	**189**	**97**	**123**	**102**	**209**	**206**	**137**	**143**	**119**	**149**	**137**	**133**	**114**	**177**	**196**	**919**
Departure	**+8**	**+54**	**+2**	**−1**	**+9**	**+1**	**−4**	------	------	**−3**	**−10**	**−27**	**−12**	**0**	**+44**	**−21**	**+35**	**+21**	**−23**	**−10**	------	------	------
Dec. 24	54	66	165	56	25	97	------	38	100	17	97	140	111	109	------	67	50	118	113	251	228	126	862
Dec. 25	45	200	212	55	19	64	------	58	6	22	184	154	164	19	10	16	16	15	27	75	222	113	57
Dec. 26	162	214	154	186	176	156	------	192	127	90	138	273	276	147	186	142	230	330	149	27	151	82	1,157
Dec. 27	37	83	243	25	67	128	0	51	54	7	173	259	241	135	60	122	35	32	140	24	224	278	537
Dec. 28	198	205	107	165	216	218	5	148	155	19	82	267	262	182	114	153	157	228	191	83	222	105	1,420
Dec. 29	104	117	42	70	146	267	12	56	181	38	162	212	234	219	178	210	182	114	242	160	215	271	1,578
Dec. 30	32	62	48	66	91	241	0	29	64	35	148	289	312	191	117	194	65	49	219	132	244	244	583
Dec. 31	38	29	202	12	29	148	0	41	24	12	184	282	309	45	54	40	49	26	------	220	178	325	270
Mean (8-day)	**84**	**122**	**168**	**79**	**96**	**165**	**3**	**77**	**89**	**30**	**146**	**234**	**239**	**131**	**103**	**118**	**98**	**130**	**154**	**122**	**210**	**193**	**808**
Departure	**−61**	**+6**	**+8**	**−3**	**−27**	**+22**	**−3**	------	------	**−62**	**+15**	**+8**	**+35**	**+6**	**+8**	**−17**	**−1**	**+34**	**+5**	**−5**	------	------	------

ACCUMULATED DEPARTURES ON DEC. 31, 1944

−5,665	**−582**	**−10,580**	------	**−5,318**	**+3,552**	------	------	------	**+3,599**	------	------	------	**−137**	------	**−6,003**	**−1,155**	**+1,851**	**+2,775**	**−2,088**	------	------	------

PERCENTAGE DEPARTURES FOR THE YEAR

−4.6	**−0.5**	**−7.9**	------	**−4.7**	**+2.2**	------	------	------	**+3.0**	------	------	------	**−0.1**	------	**−4.7**	**−1.0**	**+1.7**	**+2.3**	**−1.2**	------	------	------