SOLAR RADIATION AND SUNSPOT DATA FOR DECEMBER 1946

[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 MONTHLY WEATHER REVIEW, vol. 72, page 43, January 1944. A list of pyrheliometric stations is given on page 45 of the same REVIEW.

Restandardization of pyrheliometric equipment at Davis, Calif., showed that readings made prior to July 2, 1946, were too high; therefore, these values should be multiplied by 0.918. All values since July 2, 1946, are correct.

Restandardization of pyrheliometric equipment at Tooele, Utah, showed that readings made prior to July 2, 1946, were too high; therefore, these values should be multiplied by 0.903. All values since July 2, 1946, are correct.

TABLE 1.—*Solar radiation intensities during December 1946*

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

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									75th mer. 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.
MADISON, WIS.											
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
Dec. 2	1.4	0.81	0.94	------	------	------	------	------	------	------	2.7
Dec. 3	3.5	------	.62	0.84	------	1.27	------	------	------	------	4.0
Dec. 4	3.8	.58	.76	.99	------	1.28	------	------	------	------	6.1
Dec. 7	7.8	.49	.62	.77	------	------	------	------	------	------	9.4
Dec. 11	5.3	------	.87	1.07	------	1.41	------	------	------	------	4.4
Dec. 13	1.5	.96	1.03	1.21	------	1.65	------	------	------	------	1.2
Dec. 24	3.1	1.02	1.15	1.25	------	------	------	------	------	------	2.9
Dec. 31	0.5	------	.95	.99	------	------	------	------	------	------	.6
Means	------	.77	.87	1.02	------	1.40	------	------	------	------	------
Departures	------	−.14	−.17	−.17	------	−.12	------	------	------	------	------
LINCOLN, NEBR.											
Dec. 8	7.8	0.86	0.99	1.14	------	------	------	1.18	1.05	0.96	8.7
Dec. 9	4.8	------	------	1.03	------	------	------	1.09	1.03	.92	8.1
Dec. 10	3.8	.89	1.00	1.14	------	------	------	1.16	1.03	.94	5.1
Dec. 11	5.6	.83	.94	1.09	------	------	------	1.11	.96	.88	5.6
Dec. 16	8.7	------	------	------	------	------	------	1.03	.92	.85	4.6
Dec. 17	1.7	------	1.09	1.24	------	------	------	1.22	1.07	1.01	1.4
Dec. 18	1.7	------	.85	1.00	------	------	------	1.11	.96	.88	1.7
Dec. 21	4.8	1.01	1.09	1.20	------	------	------	1.24	1.14	1.05	4.4
Dec. 23	4.2	.92	1.01	1.14	------	------	------	1.18	1.05	.96	3.3
Means	------	.90	1.00	1.12	------	------	------	1.15	1.02	.94	------
Departures	------	−.05	−.09	−.10	------	------	------	−.04	−.04	.00	------
TABLE MOUNTAIN, CALIF.											
Dec. 7	------	------	------	------	1.54	------	------	------	------	------	------
Dec. 9	------	------	------	------	1.50	------	------	------	------	------	------
Dec. 14	------	------	------	------	1.55	------	------	------	------	------	------
Dec. 16	------	------	------	------	1.57	------	------	------	------	------	------
Dec. 29	------	1.24	1.34	1.44	1.56	------	------	------	------	------	------
Dec. 31	------	------	------	------	1.55	------	------	------	------	------	------
Means	------	(1.24)	(1.34)	(1.44)	1.54	------	------	------	------	------	------

SOLAR RADIATION OBSERVATIONS—Continued

TABLE 1.—*Solar radiation intensities during December 1946*—Con.

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

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									75th mer. 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.
CLIMAX, COLO.											
Dec. 1	------	------	------	1.40	1.50	------	------	------	------	------	------
Dec. 2	------	------	1.24	1.40	1.53	------	------	1.33	1.17	1.04	------
Dec. 9	------	------	------	------	------	------	1.58	1.36	1.20	1.10	------
Dec. 10	------	------	------	1.24	1.50	------	------	------	------	------	------
Dec. 16	------	------	1.30	1.44	1.56	------	------	1.40	1.27	1.17	------
Dec. 17	------	------	------	1.33	1.48	------	------	------	------	------	------
Dec. 18	------	1.27	1.38	1.50	1.58	------	------	1.40	1.27	1.24	------
Dec. 21	------	1.25	1.35	1.44	------	------	------	------	1.32	1.25	------
Dec. 24	------	------	1.30	1.40	1.54	------	------	------	------	------	------
Dec. 26	------	1.19	1.27	1.33	1.50	------	------	1.39	------	------	------
Dec. 28	------	1.24	1.32	1.45	1.53	------	------	------	------	------	------
Dec. 29	------	------	1.38	1.49	1.62	------	------	1.45	1.33	1.24	------
Dec. 30	------	1.16	1.30	1.41	------	------	------	------	------	------	------
Dec. 31	------	1.28	1.40	1.52	1.64	------	------	1.50	1.40	1.32	------
Means	------	1.23	1.32	1.41	1.54	------	(1.58)	1.40	1.28	1.19	------
BLUE HILL, MASS.											
Dec. 4	3.5	0.58	0.70	0.89	------	------	------	------	------	------	4.2
Dec. 7	6.5	------	------	------	------	------	------	0.88	0.72	------	6.5
Dec. 11	4.4	------	1.15	1.26	------	------	------	1.24	1.12	1.03	3.0
Dec. 13	15.0	------	------	------	------	------	------	1.24	1.06	.96	4.2
Dec. 14	1.8	.99	1.09	1.25	------	------	------	------	------	------	1.9
Dec. 16	2.1	.97	1.12	1.27	------	------	------	1.29	1.19	1.07	1.5
Dec. 22	3.6	.78	.89	------	------	------	------	------	------	------	3.0
Dec. 23	3.3	.86	.96	1.08	------	------	------	------	------	------	3.7
Dec. 25	2.5	.89	1.07	------	------	------	------	------	------	1.01	2.1
Dec. 26	3.3	------	------	------	------	------	------	1.28	------	1.05	1.8
Dec. 27	0.7	1.02	------	------	------	------	------	------	------	------	1.4
Dec. 30	3.6	.92	1.01	1.13	------	------	------	1.14	1.11	1.01	3.9
Means	------	.88	1.00	1.15	------	------	------	1.18	1.04	1.02	------
Departures	------	−.01	−.03	−.02	------	------	------	+.03	+.01	+.05	------
BOSTON, MASS.											
Dec. 4	3.1	------	0.72	0.81	------	------	------	------	------	------	3.8
Dec. 11	4.6	------	1.05	1.12	------	------	------	1.10	1.08	0.91	3.1
Dec. 13	15.3	------	------	------	------	------	------	------	.88	.80	3.8
Dec. 16	2.3	0.83	1.02	1.06	------	------	------	------	------	------	1.7
Dec. 19	2.6	.58	.64	.91	------	------	------	------	------	------	2.6
Dec. 23	3.8	.75	.80	.95	------	------	------	------	------	------	4.4
Means	------	.72	.85	.97	------	------	------	(1.10)	(.98)	(.86)	------
Departures	------	+.01	+.01	−.01	------	------	------	+.25	+.13	+.12	------
RATIO, BOSTON/BLUE HILL, ON COMPARABLE DATES											
------	------	(.86)	.92	.88	------	------	------	(.89)	(.90)	(.86)	------

*Extrapolated.

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

[Gram calories per square centimeter]

Date	Washington, D. C.	Madison, Wis.	Lincoln, Nebr.	East Lansing, Mich.	New York, N. Y.	Fresno, Calif.	Columbia, Mo.	Boston, Mass.	Nashville, Tenn.	Twin Falls, Idaho	La Jolla, Calif.	Riverside, Calif.	Blue Hill, Mass.	Newport, R. I.	State College, Pa.	Put-in-Bay, Ohio	Salt Lake City, Utah	Davis, Calif.	Tooele, Utah	New Orleans, La.	Toronto, Canada	Ithaca, N. Y.	Boulder, Colo.	Soda Springs, Calif.
1946	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Dec. 3	168	179	241	56	129	56	263	112	215	104	186	208	180	221	176	84	156	36	125	307	18	156	169	153
Dec. 4	253	185	227	159	134	64	247	116	229	82	148	174	170	186	184	166	80	31	74	321	78	77	165	34
Dec. 5	240	143	153	116	124	68	220	54	221	41	268	233	111	159	136	97	188	53	146	290	63	65	161	41
Dec. 6	161	106	166	101	148	54	218	2	209	140	118	162	36	67	114	158	172	47	151	279	14	151	220	49
Dec. 7	184	117	83	136	78	161	170	82	155	35	248	296	158	178	110	160	54	99	40	273	98	163	193	148
Dec. 8	187	89	162	70	88	261	87	90	237	84	----	277	134	138	137	104	240	168	204	204	63	108	248	170
Dec. 9	227	130	236	32	66	152	22	7	176	123	----	302	43	81	159	50	200	232	238	----	49	119	241	239
Means	203	136	181	96	110	117	175	66	206	87	193	236	119	147	145	117	156	95	140	279	55	120	200	119
Departures	+42	+19	+8	+6	−15	−63	+27	−34	+84	−35	−48	+13	−16	+9	+19	−3	----	−75	−63	+65	−29	+18	−1	----
Dec. 10	187	172	253	62	116	209	127	98	40	171	270	276	128	148	80	30	128	166	156	174	15	30	193	255
Dec. 11	117	192	230	154	190	209	38	177	46	141	274	289	199	206	215	150	91	106	208	149	154	205	98	209
Dec. 12	94	20	135	1	11	133	39	64	34	82	259	280	83	55	18	17	98	56	224	138	14	9	172	242
Dec. 13	250	212	122	174	192	27	105	157	218	53	153	258	172	156	211	217	180	33	237	261	131	155	217	193
Dec. 14	252	89	41	168	157	33	52	161	238	111	91	267	201	206	205	152	246	26	264	294	93	80	141	254
Dec. 15	109	49	55	148	53	49	53	131	55	36	138	290	151	95	89	64	89	60	137	291	115	123	192	115
Dec. 16	125	13	188	13	175	26	39	174	163	172	87	258	217	218	112	12	275	233	260	188	48	174	227	263
Means	162	107	146	103	128	98	65	137	113	110	182	274	164	155	133	92	158	97	213	214	81	111	177	219
Departures	+20	−11	−14	+3	+11	−67	−85	+25	−19	−16	−53	+65	+25	+8	+19	−18	----	−67	+3	+16	−17	−7	−21	----
Dec. 17	167	184	248	91	42	46	261	8	43	198	216	252	24	20	108	211	184	210	171	108	175	168	196	219
Dec. 18	155	169	218	74	62	40	259	23	245	142	209	268	53	24	176	195	277	236	246	270	115	138	268	256
Dec. 19	176	125	134	119	128	150	163	138	143	119	270	288	182	167	168	26	92	128	99	122	144	159	178	256
Dec. 20	33	119	76	82	14	103	181	34	19	163	222	215	62	55	19	----	254	51	242	68	29	76	224	197
Dec. 21	70	78	240	93	10	113	166	4	99	173	155	230	17	10	39	46	218	141	213	322	40	75	97	173
Dec. 22	184	89	220	60	133	70	267	139	225	86	127	119	147	149	108	52	55	141	81	311	159	121	225	152
Dec. 23	126	142	218	78	111	160	91	132	227	184	68	65	158	138	147	34	224	128	183	281	35	96	90	139
Means	130	129	194	85	71	98	198	68	143	152	181	205	92	80	109	94	186	148	176	212	100	119	182	199
Departures	−19	+7	+24	−12	−41	−47	+46	−40	−6	+38	−42	−7	−45	−56	−23	−28	----	+41	−16	−4	+3	+18	−8	----
Dec. 24	233	188	117	89	116	32	211	139	205	170	65	72	136	142	167	51	32	36	69	260	67	192	211	52
Dec. 25	246	93	189	74	217	52	235	116	256	107	45	50	151	137	136	90	147	59	92	280	88	176	227	138
Dec. 26	231	177	187	179	109	42	152	104	181	63	221	176	136	92	161	176	21	62	35	220	161	121	214	114
Dec. 27	92	14	80	38	79	183	101	130	142	57	153	92	183	152	74	27	95	249	72	192	31	147	214	137
Dec. 28	210	40	40	73	88	245	144	2	156	188	233	257	16	25	150	65	309	244	277	----	57	34	38	248
Dec. 29	29	76	239	62	8	237	149	11	32	144	275	302	33	19	10	17	261	58	271	29	8	51	260	195
Dec. 30	178	187	225	195	193	63	157	178	40	170	284	325	206	201	228	148	288	263	244	----	167	150	158	277
Dec. 31	46	191	219	113	72	190	125	100	25	79	288	323	126	133	75	121	234	244	251	----	117	143	294	230
Means (8-day)	158	121	162	103	110	130	159	98	129	122	195	203	123	112	125	87	174	152	164	196	87	127	202	174
Departures	+14	+6	+3	+21	−11	−11	+29	−5	+58	−7	−27	−1	−2	−19	+35	+7	----	+28	−11	+25	+3	+29	+12	----

ACCUMULATED DEPARTURES ON DECEMBER 31, 1946

	+5,677	+4,570	−2,741	+3,227	−10,504	+3,503	----	+226	+2,655	−5,985	----	+1,651	−2,480	−3,260	+6,454	----	----	+11,375	−2,111	----	----	----	+1,440	----

PERCENTAGE DEPARTURES FOR THE YEAR

	+4.6	+3.8	−2.1	+3.1	−9.3	+2.1	----	+0.2	+2.2	−4.3	----	+1.1	−2.0	−2.6	+5.6	----	----	+7.1	−1.3	----	----	----	+1.0	----