SOLAR RADIATION DATA FOR NOVEMBER 1949

Explanation of tables 1 and 2 and references to descriptions of instruments, stations, and methods of observation, and to summaries of data, are given in the MONTHLY WEATHER REVIEW, volume 72, No. 1, January 1944, page 43. A list of pyrheliometric stations is given on page 45 of that issue. An explanation of the formula used in computing the air mass values for each station listed in table 1 appears in volume 75, No. 3, March 1947, page 47.

Beginning with this issue, publication of the values of daily totals and weekly means of solar and sky radiation received on a horizontal surface at Amherst, Mass., will be included regularly in table 2. The station is located at the University of Massachusetts, and the program is under the direct supervision of Dr. H. N. Stapleton, research engineer. Coordinates of the station are: Latitude 42°24′ N.; longitude 72°32′ W.; elevation 89.6 meters m. s. l. An Eppley 180° pyrheliometer and Brown strip-chart recorder are used. Some brief but unimportant shading of the pyrheliometer is caused by a smokestack located about 200 yards to the south, and smoke therefrom produces slight pollution of an otherwise unusually clear atmosphere.

TABLE 1.—*Solar radiation intensities during November 1949*

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

MADISON, WIS.

Date	Sun's zenith distance: A. M. 78.7°	75.7°	70.7°	60.0°	0.0°	P. M. 60.0°	70.7°	75.7°	78.7°	Vapor pressure 7:30 a. m.[1]	1:30 p. m.[1]
	Air mass 4.81	3.84	2.88	1.92	*0.96	1.92	2.88	3.84	4.81		
November										*Mb.*	*Mb.*
1	0.83	0.94	1.03	1.16						3.8	5.1
5	.95	1.04								2.5	5.1
7	.76	.90	1.03	1.18		1.19				5.3	8.7
8	.92	1.02	1.13	1.21		1.24				6.4	7.8
22	.94	1.03	1.13							2.3	3.7
29	.96	1.06	1.18							5.6	6.4
30	.98	1.06	1.14							4.4	3.7
Means	.91	1.01	1.11	1.18		1.22					
Departures	+.05	+.03	−.02	−.12		−.10					

LINCOLN, NEBR.

	Air mass 4.77	3.81	2.86	1.91	*0.95	1.91	2.86	3.81	4.77		
November										*Mb.*	*Mb.*
2						1.24	1.05	0.92	0.83	6.4	3.2
3				1.18		1.16	1.01	.88	.82	3.3	6.1
4			1.03	1.18		1.16	.99	.86	.73	7.2	8.7
5				1.11		1.11	.94	.79	.70	4.0	6.1
7	0.79	0.92	1.05	1.20		1.21	1.01	.88	.77	6.9	7.4
15						1.27	1.12	.99	.88	3.7	3.3
16						1.24	1.09	.96	.88	3.2	3.0
21							1.14	1.01	.90	2.6	3.3
22							1.07	.92	.81	2.9	4.2
26	.83	.94	1.09							6.6	4.0
29	.88	1.01	1.14							5.3	3.8
Means	.83	.96	1.08	1.17		1.20	1.05	.91	.81		
Departures	−.06	−.05	−.08	−.18		−.12	−.11	−.11	−.09		

TABLE 1.—*Solar radiation intensities during November 1949*—Con.

TABLE MOUNTAIN, CALIF.

Date	Sun's zenith distance: A. M. 78.7°	75.7°	70.7°	60.0°	0.0°	P. M. 60.0°	70.7°	75.7°	78.7°	Vapor pressure 7:30 a. m.[1]	1:30 p. m.[1]
	Air mass 3.76	3.01	2.26	1.51	*0.75	1.51	2.26	3.01	3.76		
November											
1				1.50							
2				1.51							
3				1.53							
4	1.20	1.28	1.39	1.51							
11				1.52							
12	1.23	1.30	1.41	1.53							
13				1.52							
17				1.49							
18				1.49							
22	1.15	1.23	1.34	1.47							
25				1.47							
27				1.46							
28				1.47							
29				1.48							
Means	1.19	1.27	1.38	1.50							
Departures	+.01	+.01	+.01	.00							

BOSTON, MASS.

	Air mass 4.96	3.96	2.97	1.98	*0.99	1.98	2.97	3.96	4.96		
November										*Mb.*	*Mb.*
8						1.03	0.83	0.62	0.41	8.7	8.7
9								1.01	.92	5.6	5.1
14							1.15	.98	.85	13.7	8.1
15			0.30				.81	.58	.47	7.4	6.6
21			.90							4.8	5.8
30			.83				.85	.65	.59	6.1	6.1
Means			.68			1.03	.91	.77	.65		
Departures			−.20			−.09	−.07	−.08	−.09		

BLUE HILL, MASS.

	Air mass 4.86	3.89	2.92	1.94	*0.97	1.94	2.92	3.89	4.86		
November										*Mb.*	*Mb.*
2							1.17	1.06	0.96	7.8	8.6
3	0.70	0.82	0.96	1.21						8.3	9.8
5	.96	1.07	1.19							5.7	5.7
6	.81	.93	1.11							4.3	4.3
8						1.11	.86	.72	.57	8.6	8.5
9	.95	1.06	1.17			1.34	1.24	1.12	1.01	6.0	5.0
10	.32	.44	.65	.99			.89	.73	62	7.7	10.4
12						1.18	1.08			5.3	4.2
14							1.19	1.04	.93	13.8	7.5
15	.82	.93	1.06	1.27			1.13	.97	.84	6.3	6.3
16	.72						1.01	.84	.82	7.4	6.6
21			1.06						.82	4.7	5.1
22								1.07	.96	3.0	2.5
26		.83				1.39	1.25	1.12	1.01	2.5	1.9
30	.76	.89	1.03				.96		.79	5.8	5.7
Means	.76	.87	1.03	1.16		1.26	1.08	.96	.85		
Departures	−.14	−.13	−.08	−.11		.00	−.03	−.02	−.01		

RATIO, BOSTON-BLUE HILL ON COMPARABLE DATES

			0.65			0.93	0.88	0.83	0.78		

*Extrapolated.
[1] 75th Meridian time.

TABLE 2.—*Daily totals and weekly means of solar radiation (direct+diffuse) received on a horizontal surface during November 1949*

[Gram-calories per square centimeter]

Date	Honolulu, T. H.	Pearl Harbor, T. H.	La Jolla, Calif.	Riverside, Calif.	Nashville, Tenn.	Fresno, Calif.	Davis, Calif.	Washington, D. C.	Columbia, Mo.	Soda Springs, Calif.	Seabrook, N. J.	Grand Lake, Colo.	Salt Lake City, Utah	New York, N. Y.	State College, Pa.	Lincoln, Nebr.	Newport, R. I.	Put-in-Bay, Ohio	East Wareham, Mass.	Blue Hill, Mass.	Boston, Mass.	Amherst, Mass.	Lynn, Mass.	Ithaca, N. Y.	Twin Falls, Idaho	East Lansing, Mich.	Madison, Wis.	Portland, Maine	Toronto, Canada	Caribou, Maine	Summit, Mont.	Fairbanks, Alaska
Oct. 29	535	490	350	367	171	344	330	86	.....	371	152	56	194	.....	215	329	246	321	200	240	228	.....	224	.....	290	254	306	217	209	258	123	.....
Oct. 30	546	387	358	362	42	357	356	51	.....	390	58	410	328	.....	95	258	198	260	232	177	159	.....	178	.....	273	176	122	142	181	250	254	.....
Oct. 31	441	266	361	364	34	367	349	188	.....	382	166	385	333	146	177	353	94	182	63	49	51	.....	53	.....	323	91	329	76	122	34	223	.....
Nov. 1	346	320	366	364	366	349	350	101	.....	388	83	369	306	123	316	326	94	337	124	146	133	202	153	.....	306	265	278	215	223	208	255	.....
Nov. 2	570	518	368	360	358	346	334	336	.....	379	319	373	298	254	313	330	174	169	93	215	210	272	219	.....	306	88	70	259	83	145	246	.....
Nov. 3	301	359	342	354	251	347	332	100	.....	360	232	373	300	175	36	329	133	22	144	198	153	235	168	.....	302	31	197	219	83	116	253	.....
Nov. 4	479	411	361	350	368	352	332	245	.....	(376)	264	370	287	289	100	314	265	32	171	87	99	79	106	.....	293	63	131	47	112	11	230	.....
Means	460	393	358	360	227	352	340	158	.....	378	182	334	292	197	179	320	172	189	147	159	148	197	157	.....	299	138	205	168	145	146	226	.....
Departures	−6	−20	+19	+46	+11	+27	+49	−78	.....	+44	.....	+6	+8	−6	+1	+89	−40	−4	−51	−48	−13	.....	.....	.....	+86	00	+23	.....	+11	.....	+41	.....
Nov. 5	356	319	343	341	341	333	218	78	.....	342	171	362	279	104	78	314	227	260	192	172	124	114	131	.....	290	252	275	108	188	119	230	.....
Nov. 6	440	395	337	337	348	299	176	221	.....	263	306	359	282	302	144	293	290	121	269	189	150	150	186	.....	279	153	278	186	34	153	219	.....
Nov. 7	488	438	300	313	361	181	152	295	.....	60	246	351	245	72	272	314	102	300	84	72	54	58	65	.....	106	196	272	78	97	125	(226)	.....
Nov. 8	504	437	265	195	349	179	157	303	.....	75	291	339	240	256	299	275	266	297	261	259	225	217	236	.....	95	215	271	223	214	41	31	.....
Nov. 9	452	455	196	133	336	60	.....	283	.....	24	248	167	81	299	252	285	292	279	263	288	256	268	269	.....	45	210	222	273	210	220	90	.....
Nov. 10	554	576	77	84	346	302	203	252	.....	170	253	127	29	219	265	228	254	202	251	249	198	166	200	.....	70	153	151	177	83	142	72	.....
Nov. 11	169	195	324	321	284	333	276	239	.....	375	220	117	281	196	231	248	125	195	129	111	102	168	134	.....	228	86	36	61	21	233	64	.....
Means	423	402	263	246	338	241	197	239	.....	187	248	260	205	207	220	280	222	236	207	192	158	163	174	.....	159	181	215	158	121	148	133	.....
Departure	−12	+4	−43	−53	+130	−50	−63	+18	.....	−81	.....	−26	−35	+27	+68	+56	+24	+72	+36	+11	+20	.....	.....	.....	−41	+73	+55	.....	+15	.....	−13	.....
Nov. 12	482	432	330	343	252	309	340	196	.....	355	50	313	280	27	136	82	115	201	170	241	226	112	243	.....	256	30	36	274	49	175	17	.....
Nov. 13	387	386	324	342	97	322	294	137	.....	334	57	329	288	21	44	290	72	50	77	50	27	16	34	.....	254	28	235	30	31	181	53	.....
Nov. 14	386	407	329	316	294	260	238	293	.....	286	238	303	239	215	169	293	240	165	223	220	220	201	162	.....	201	34	50	151	45	43	39	.....
Nov. 15	471	476	321	324	320	307	273	264	.....	338	220	237	258	192	212	280	257	112	253	251	190	232	202	.....	249	77	56	236	46	117	133	.....
Nov. 16	440	364	325	316	282	277	243	155	.....	279	187	276	239	221	69	208	251	116	263	196	157	216	156	.....	228	33	122	101	84	178	161	.....
Nov. 17	514	387	311	314	200	290	235	113	.....	(310)	188	303	244	173	63	244	54	74	20	36	27	113	37	.....	236	68	62	73	83	67	149	.....
Nov. 18	365	329	311	299	190	293	295	136	.....	330	166	274	241	49	119	255	112	136	84	153	143	130	160	.....	248	109	118	207	86	135	124	.....
Means	435	397	322	322	234	294	274	185	.....	319	158	291	256	128	116	236	158	122	156	164	142	146	142	.....	239	54	97	153	61	128	90	.....
Departure	−13	−17	+34	+43	+22	+46	+60	−17	.....	+39	.....	+13	+25	−25	−49	+28	−23	− 28	−17	+1	+6	.....	.....	.....	+74	−51	−54	.....	−43	.....	−15	.....
Nov. 19	472	371	265	298	304	230	306	163	.....	325	219	290	247	150	92	251	262	54	253	245	210	186	204	.....	250	36	151	198	25	160	165	.....
Nov. 20	428	446	280	194	294	271	283	220	.....	(303)	187	302	245	.....	70	239	88	94	96	82	80	41	88	.....	243	72	78	49	77	68	(194)	.....
Nov. 21	497	491	134	168	142	245	271	264	.....	(305)	152	306	235	181	83	250	147	103	127	167	140	103	150	.....	240	129	112	104	209	108	(182)	.....
Nov. 22	518	483	117	280	313	245	264	263	.....	294	243	287	209	270	243	260	140	180	184	147	129	212	157	.....	231	150	206	207	184	113	(91)	.....
Nov. 23	521	486	202	272	285	229	221	249	.....	244	246	127	154	186	212	196	125	89	90	200	176	135	167	.....	55	92	238	115	95	105	42	.....
Nov. 24	524	458	287	261	54	222	276	192	.....	(292)	209	291	193	.....	77	226	228	32	263	221	188	173	182	.....	153	21	34	148	36	189	58	.....
Nov. 25	542	480	154	247	82	242	240	.....	.....	298	88	278	173	.....	10	242	17	198	25	30	20	.....	26	.....	151	113	96	45	201	19	22	.....
Means	500	459	206	246	211	248	266	225	.....	294	192	269	208	197	112	238	144	107	148	156	135	142	139	.....	189	88	131	124	118	109	108	.....
Departure	+25	+25	−75	−28	+29	+13	+36	+40	.....	+3	.....	+6	−8	+54	−18	+43	−11	−10	+8	+10	+31	.....	.....	.....	+32	00	+2	.....	+32	.....	+8	.....
Nov. 26	508	492	146	266	304	209	138	.....	.....	268	276	201	239	.....	268	242	243	168	172	231	178	239	182	.....	138	89	63	163	205	86	87	.....
Nov. 27	459	422	139	265	250	187	243	109	.....	177	115	164	227	.....	32	178	55	37	94	66	64	74	71	.....	160	69	223	126	54	145	42	.....
Nov. 28	503	477	212	168	117	188	87	139	.....	283	202	124	166	.....	118	183	54	83	31	26	27	.....	34	.....	104	80	101	151	75	181	41	.....
Nov. 29	412	388	192	266	214	222	250	125	.....	282	46	249	221	.....	147	252	12	82	52	11	18	13	9	.....	220	117	225	20	32	87	106	.....
Nov. 30	478	445	193	270	283	189	216	239	.....	245	214	278	120	.....	188	247	225	190	220	214	185	178	170	.....	184	97	139	170	71	86	34	.....
Dec. 1	449	321	226	276	254	99	247	240	.....	285	234	277	199	.....	110	229	164	151	148	186	147	159	144	.....	199	99	80	192	115	182	98	.....
Dec. 2	435	408	142	282	287	70	136	90	.....	(256)	46	278	188	.....	49	210	34	246	63	70	37	65	67	.....	113	227	138	92	77	188	(38)	.....
Means	464	422	178	256	244	166	188	157	.....	256	162	224	194	.....	130	220	112	137	111	115	94	121	97	.....	160	111	138	130	90	136	94	.....
Departure	−3	−5	−77	+2	+76	−37	+1	−9	.....	+17	.....	−2	+8	.....	00	+39	−41	+23	−25	−32	−1	.....	.....	.....	+15	+21	+10	.....	−10	.....	00	.....

ACCUMULATED DEPARTURES ON DECEMBER 2, 1949

	+329	+364	−12110	.....	+8491	+10948	.....	−2114	.....	+1393	.....	.....	−896	.....	+8036	−2016	+5803	+10899	+3609	+6685	+12131	.....	.....	.....	+5341	−3276	+9668	.....	+364	.....	+581	.....

NOTE.—Values in parentheses are interpolated.

TABLE 3.—*Daily totals and weekly means of solar and sky radiation plus the radiation reflected from the ground, as received on a vertical surface facing south at Blue Hill, Mass., during November 1949*

Date	29	30	31	1	2	3	4	Mean	5	6	7	8	9	10	11	Mean	12	13	14	15	16	17	18	Mean
Gm cal cm^{-2}	299	152	34	108	293	262	76	175	228	214	38	436	508	415	121	280	378	20	370	471	326	20	171	251
Date	19	20	21	22	23	24	25	Mean	26	27	28	29	30	1	2	Mean	----	----	----	----	----	----	----	----
Gm cal cm^{-2}	462	63	285	206	339	344	10	244	----	31	15	5	464	347	42	151	----	----	----	----	----	----	----	----

TABLE 4.—*Daily totals and weekly means of solar and sky radiation plus the radiation reflected from the ground, as received on a vertical surface facing north at Blue Hill, Mass., during November 1949*

Date	29	30	31	1	2	3	4	Mean	5	6	7	8	9	10	11	Mean	12	13	14	15	16	17	18	Mean
Gm cal cm^{-2}	50	53	18	50	46	44	30	42	38	47	23	43	34	35	22	34	29	16	38	36	44	13	41	31
Date	19	20	21	22	23	24	25	Mean	26	27	28	29	30	1	2	Mean	----	----	----	----	----	----	----	----
Gm cal cm^{-2}	40	30	35	42	35	44	8	33	41	26	14	2	29	34	26	24	----	----	----	----	----	----	----	----

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