METEOROLOGICAL OFFICE—THE OBSERVER'S HANDBOOK, LONDON, 1934

[Review]

This book illustrates what can be done in the way of compactness without sacrifice of necessary detail. It is the latest addition to a distinguished series; the earlier volumes were called "Instructions for Meteorological Observers."

The book is divided into three main sections: Part I contains instructions for making routine observations at the normal climatological stations, in addition to notes on the care and exposure of instruments; part II deals with the automatic registering instruments that are not included ordinarily in the usual station equipment; while part III consists of tables for the reduction of barometric data. An appendix contains cloud photographs.

The plan of the volume is excellent; it combines instructions for the care, operation, and exposure of the various instruments with details of the proper methods of taking observations; and, in addition, includes many interesting items of information as to the "why" of certain procedures. The system of designating and classifying stations differs from that of the United States Weather Bureau; but the Handbook is a useful reference manual for anyone.

The cloud illustrations are excellent. The cumulonimbus is particularly fine; the anvil cloud is an impressive sight, as good photographs of such a distinctive type are rare. The altostratus illustration is a fine representation of a type difficult to portray accurately.—*W. A. Mattice.*

BIBLIOGRAPHY

C. FITZHUGH TALMAN, *in charge of Library*

RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

Arnold, J. Howard

The theory of the psychrometer. 1933. pp. 255–262, 334–340. 27 cm. (Physics. Vol. 4. July and September 1933.)

Gorczynski, Ladislas

Climat solaire de Nice et de la Côte d'Azur. Nice. 1934. vii, 208 p. ill., tables. 24 cm. (Mémoire IV de l'Association des Naturalistes de Nice et des Alpes-Maritimes. "Riviera Scientifique," années 1933–34.)

Great Britain. Meteorological office

Monthly frequency tables, being summaries of observations of horizontal visibility. 1927–33. London. 1927–34. 31½ cm.

Jones, L. R., and Gilbert, W. W.

Lightning injury to potato and cotton plants. n. d. pp. 94–102. pl. 27 cm. (Repr. from Phytopathology, vol. 5, no. 2, April 1915.)

Lagaye, Jean de

Variation diurne et annuelle de la température au sommet du Puy de Dôme. [1933.] pp. 472–474. 24 cm. (Extrait du 66. Congrès des Sociétés savantes, 1933.)

Leick, Erich

Der Tau als Standortsfaktor. pp. 409–442. diagrs. 1934. (Reprint: Berichten der Deutsch. Botan. Gesellsch., Jahrg. 1933, Band 51, H. 10, ausgeg. 25. January 1934.)

Mills, C. A.

Acute appendicitis and the weather. Cincinnati. [1934.] 7 p. charts. table. 25½ cm. (Repr.: Jnl. medicine, Cincinnati, March 1934.)

Climate as a factor in the health of man. n. d. pp. 573–592. diagrs. 26 cm. (Repr.: Amer. jnl. hygiene, vol. 15, no. 2, March 1932.)

—— and Senior, Mrs. F. A.

Does climate affect the human conception rate? Chicago. n. d. 9 p. charts. 25½ cm. (Repr.: Archives of internal medicine, December 1930, vol. 46, pp. 921–929.)

Patton, C. A.

Some observations on forty-six years of Ohio weather. Wooster. 1934. 32 p. ill., tab. 23 cm. (Ohio agric'l exper. station. Bull. 544. December 1934.)

Schmidt, Wilhelm

Kleinklimatische Beobachtungen in Österreich. Leipzig & Wien. 1933. pp. 42–72. maps and fold. map. 24 cm. (Geogr. Jahresber. aus Österreich, 16. Band.)

Neue Wege meteorologischer Forschung und ihre Bedeutung für Praxis und Leben. n. d. pp. 79–114. ill. 23 cm. (Sonderdruck aus "Deutsche Forschung.")

Weickmann, L.

Die meteorologischen Ergebnisse der Polarfahrt des "Graf Zeppelin" Juli 1931. Leipzig. 1932. pp. 333–346. tables, fold., and plates. 22½ cm. (Abdruck: Bericht. Math.-phys. Klasse, Sächs. Akad. der Wissensch. zu Leipzig. 84 Band, 2 Nov. 1931.)

SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING JANUARY 1935

By IRVING F. HAND, Assistant in Solar Radiation Investigations

Measurements of the intensity of direct solar radiation at normal incidence are now made at Washington, D. C., Madison, Wis., and Lincoln, Nebr., by this Bureau; and by Harvard University, at Blue Hill, Mass. Summaries of all these observations are published regularly in the REVIEW.

At Washington the readings are made with a Marvin pyrheliometer for the most part, and with thermopiles and a Smithsonian silver-disk pyrheliometer for special purposes; all instruments are located on the campus of the American University, about 3 miles northwest of the central office of the Weather Bureau, 5½ miles northwest of the United States Capitol and 1½ miles northwest of the Naval Observatory. There are no manufacturing plants within 3 miles of the university, but increased suburban development has gradually increased pollution of the atmosphere by smoke.

At Madison the pyrheliometric equipment is located in North Hall, University of Wisconsin, on a bluff a short distance from the south shore of Lake Mendota. Most of the manufacturing establishments are in the eastern part of the city, but some contamination results from the

university's heating plant and the railroad lines adjoining the campus.

At Lincoln the radiation apparatus is located on the farm campus of the State University, 2½ miles northeast of the business section of the city. With a west or northwest wind the atmosphere is very clear; but with other directions, smoke from railroads and industrial plants often depletes radiation receipt.

Marvin pyrheliometers are used for normal incidence measurements at both Madison and Lincoln. These are checked at intervals with a Smithsonian silver-disk pyrheliometer.

At Blue Hill the observatory is located on the highest point of a long ridge 10 miles south of Boston, and little trouble is experienced from smoke, although occasionally with a north wind a slight smoke-effect is felt from that city. A thermopile registering continuously on a potentiometer, and frequently checked with a Smithsonian silver-disk pyrheliometer, is used for this type of measurement.

Continuous records of total radiation received from the sun and sky are regularly obtained at eight Weather Bureau stations, and at an equal number of cooperating stations through the courtesy of the Bureau of Entomology (Twin Falls, Idaho), the Scripps Institution of Oceanography (La Jolla, Calif.), Dr. O. J. Sieplein (Miami, Fla.), and the universities of Tulane (New Orleans), California (Riverside), Harvard (Blue Hill and Mount Washington), and Washington (Friday Harbor).

Through the courtesy of Dr. A. J. Heinicke, of the New York State College of Agriculture, Cornell University, Ithaca, N. Y., records will soon be available from that city for regular inclusion in the REVIEW. This Bureau is now establishing a new pyrheliometric station at San Juan, Puerto Rico; and records from this station should be available within a few weeks. The pyrheliometer at Pittsburgh has recently been moved from the business section to the airport station in the suburbs of that city, and records from this new site should also begin within a few weeks.

For a description of the different types of radiation apparatus employed at these several stations the reader is referred to Weather Bureau Circular Q, Pyrheliometers and Pyrheliometric Measurements, Washington, 1931.

The coordinates of the different stations and the instruments employed are as follows:

Stations	Instruments	Registers	Latitude, north		Longitude, west		Altitude	Under direction of—
			°	′	°	′	Feet	
Washington, D. C.	Marvin, Smithsonian, Eppley	Engelhard, and potentiometer	38	56	77	05	397	U. S. Weather Bureau.
Madison, Wis.	Marvin and Callendar	Callendar	43	05	89	23	974 1,009	Do.
Lincoln, Nebr.	do	do	40	50	96	41	1,225 1,250	Do.
Chicago, Ill.	Eppley	Engelhard	41	47	87	35	688	Do.
New York, N. Y.	do	do	40	46	73	58	156	Do.
Fresno, Calif.	do	do	36	43	119	49	330	Do.
Pittsburgh, Pa.	do	do	40	22	79	56	1,293	Do.
Fairbanks, Alaska	do	do	64	52	147	39	500	Do.
Twin Falls, Idaho	do	do	42	29	114	25	4,300	U. S. Bureau of Entomology.
La Jolla, Calif.	do	do	32	50	117	15	85	Scripps Institution of Oceanography.
Miami, Fla.	Callendar [1]	Callendar	25	41	80	12	80	Dr. O. J. Sieplein.
New Orleans, La.	Eppley	Richard	29	39	84	21	233	Tulane University.
Riverside, Calif.	do	Engelhard	33	58	117	28	1,051	University of California.
Blue Hill, Mass.	Eppley, and Eppley thermopile for normal incidence.	L. and N. potentiometer	42	13	71	07	640	Harvard University.
Mount Washington, N. H.	Eppley	Engelhard	44	16	71	18	6,270	Do.
Friday Harbor, Wash.	do	do	48	32	123	01	15	University of Washington.
San Juan, Puerto Rico	Engelhard	do	18	28	16	06	85	U. S. Weather Bureau.
Ithaca, N. Y.	Eppley	L. and N. potentiometer	42	27	76	29	953	Cornell University.

[1] Records on Ångström scale of pyrheliometry; all others on Smithsonian scale of pyrheliometry.

Table 1 shows that solar radiation intensities averaged above normal for January at all three stations for which normals have been computed.

Table 2 shows an excess in the amount of total solar and sky radiation received on a horizontal surface at all stations except Madison, Lincoln, and Riverside.

Table 3 shows considerably less water-content of the atmosphere than did the turbidity measurements for the previous month.

Polarization measurements obtained on 4 days at Washington give a mean of 55 percent, with a maximum of 60 percent on the 2d. Both of these values are slightly below the January normals for Washington. No polarization readings were obtained at Madison during January because of continuous snow coverage.

Correction.—Corrected values of the total solar and sky radiation just received from Blue Hill Observatory give for the means of the weeks beginning December 3, 10, 17, and 24, 1934: 193, 181, 132, and 173, respectively.

TABLE 1.—*Solar radiation intensities during January 1935*

[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	*1.0	2.0	3.0	4.0	5.0	e
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.
Jan. 2	1.45	0.87	1.04	1.18	1.45			1.16	1.12	0.98	1.96
Jan. 3	2.87	1.01	1.14	1.27	1.43						2.74
Jan. 4	1.45	.87	1.14	1.20	1.45			1.24	1.09	.92	1.45
Jan. 5	2.06	.47	.69	1.01	1.14						3.00
Jan. 12	2.49		.62								2.49
Jan. 24	.81	1.07	1.19	1.30	1.47			1.12			1.02
Means		.86	.97	1.19	1.39			1.17	(1.10)	(.95)	
Departures		+.12	+.11	+.17	+.15			+.12	+.21	+.14	

* Extrapolated.

TABLE 1.—*Solar radiation intensities during January 1935*—Contd.

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

MADISON, WIS.

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	*1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Jan. 3	2.49		1.19	1.37				1.37			1.24
Jan. 14	.58	1.07									.79
Jan. 17	2.26			1.20	1.44			1.28	1.17		1.68
Jan. 22	.51			.97	1.23						.86
Jan. 23	.23	1.11	1.22	1.36	1.52			1.41			.28
Jan. 29	1.96			1.22	1.32						1.78
Means		(1.09)	(1.20)	1.22	1.38			1.35	(1.17)		
Departures		+.13	+.14	+.01	+.03			+.20	+.10		

LINCOLN, NEBR.

Jan. 2	2.49	.92	1.10	1.24				1.17	1.02	.82	2.16
Jan. 3	1.24	.73	.96	1.15				1.33	1.19	1.06	.81
Jan. 4	1.37	.97	1.07	1.19				1.18	1.01	.87	1.88
Jan. 10	4.17		.93	1.22				1.32	1.19	1.05	4.75
Jan. 21	.38			1.40				1.27	1.12	.94	.71
Jan. 25	2.62				1.25				1.06	.97	4.57
Means		.87	.99	1.24	(1.25)			1.25	1.10	.95	
Departures		−.05	−.05	+.06	−.12			+.08	+.05	+.02	

TABLE 1.—*Solar radiation intensities during January 1935*—Contd.

BLUE HILL METEOROLOGICAL OBSERVATORY OF HARVARD UNIVERSITY

Date	Sun's zenith distance										
	8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.7°	70.7°	75.0°	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	*1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Jan. 2	1.3	1.00	1.10	1.28	1.49		1.49	1.26			0.7
Jan. 3	2.6			.89	1.05		1.07	.98			2.8
Jan. 4	.8	1.03	1.18	1.33	1.45		1.45	1.33	1.21	1.10	.5
Jan. 5	.7	1.05	1.12	1.20	1.29		1.29				1.6
Jan. 11	3.5	.56	.82	1.13	1.34		1.34				2.1
Jan. 12	1.8	.97	1.08	1.22	1.40		1.40	1.35			1.2
Jan. 15	.9		1.13	1.26	1.41		1.41	1.24	1.13		.7
Jan. 16	1.5		.80	1.00	1.28		1.28	1.18	1.14		1.2
Jan. 18	2.6		1.01	1.17	1.36		1.36	1.18	1.02		1.5
Jan. 19			1.02	1.17	1.36						
Jan. 24	1.6						1.34	1.20			1.3
Jan. 25	.4			1.23	1.42		1.42	1.29			.5
Jan. 26	2.0			.82	.99						1.8
Jan. 27	.6		1.18	1.30	1.43		1.43	1.36	1.26		.6
Jan. 28	.7			1.23	1.40						.6
Jan. 30	.7			1.22	1.48		1.47	1.36	1.27		.6
Jan. 31	.7			1.22	1.44		1.44	1.28			
Means		.92	1.04	1.10	1.35		1.37	1.24	1.17	1.10	

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	Miami	New Orleans	Riverside	Blue Hill	Friday Harbor
	Gram calories per square centimeter												
1935	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
January 1	234	150	217	128	139	143	15		273	182	212	207	63
January 8	186	87	164	66	117	169	7		339	251	158	142	97
January 15	145	117	159	83	111	237	33		278	164	295	174	99
January 22	192	186	224	134	155	225	46		368	263	282	221	52
	Departures from weekly normals												
January 1	+80	+20	+36	+45	+33	0	+8		−19	+19	−14		
January 8	+33	−49	−21	−14	+8	+17	−2		+39	+64	−90		
January 15	−19	−39	−36	−17	−1	+57	+18		−16	−30	+12		
January 22	+15	+3	−2	+17	+9	+14	+23		+44	+71	−13		
	Accumulated departures on Jan. 28												
	+763	−455	−161	+217	+343	+616	+329		+106	+868	−735		

TABLE 3.—*Total, I_m, and screened, I_y, I_r, solar radiation intensity measurements, obtained during January 1935, and determinations of the atmospheric turbidity factor, β, and water-vapor content, w=depth in millimeters, if precipitated*

AMERICAN UNIVERSITY, WASHINGTON, D. C.

Date and hour angle	Solar altitude	Air mass	I_m	I_y	I_r	β_{Im-r}	β_{Iy-r}	β_{mean}	$\frac{I_{w=0}}{1.94}$ (Percentage of solar constant)	$\frac{I_{w=0}-I_m}{1.94}$ (Percentage of solar constant)	w	Air-mass type
Jan. 2, 1935	° ′	*m*	*gr. cal.*	*gr. cal.*	*gr. cal.*						*mm*	
2:34 a. m.	18 24	3.14	1.132	0.908	0.726	0.072	0.022	0.047	65.0	8.6	2.6	Pc
1:57 a. m.	22 22	2.61	1.297	.956	.769	.042	.028	.035	72.8	8.2	2.6	
1:53 a. m.	22 42	2.58	1.317	.957	.770	.036	.030	.033	73.7	8.0	2.6	
Jan. 3, 1935												
3:09 a. m.	14 02	4.10	1.153	.871	.715	.032	.026	.029	65.3	7.7	1.3	Npp
3:04 a. m.	14 42	3.82	1.160	.872	.717	.018	.022	.020	69.5	9.0	2.4	
2:46 a. m.	17 02	3.39	1.242	.922	.738	.025	.018	.022	71.8	9.9	4.2	
2:38 a. m.	18 02	3.20	1.240	.941	.750	.036	.018	.027	70.1	8.3	2.2	
2:34 a. m.	18 30	3.13	1.261	.946	.753	.032	.014	.024	72.2	9.5	3.8	
Jan. 4, 1935												
3:13 a. m.	13 33	4.22	1.100	.839	.689	.038	.028	.033	62.8	8.0	1.4	Pc
3:09 a. m.	14 06	4.06	1.136	.842	.692	.028	.022	.025	66.0	9.4	2.8	
1:54 a. m.	22 47	2.58	1.320	.935	.741	.038	.018	.028	74.0	8.2	2.6	
0:57 a. m.	26 54	2.22	1.350	.932	.759	.036	.056	.046	73.7	6.3	1.4	
0:52 a. m.	27 08	2.19	1.353	.935	.759	.035	.055	.045	73.7	6.2	1.3	
Jan. 5, 1935												
3:18 a. m.	12 58	4.40	.579	.491	.414	.150	.110	.130	40.0	11.5	6.5	Npp
3:14 a. m.	13 30	4.25	.610	.495	.419	.140	.120	.130	40.6	10.2	3.7	
3:07 a. m.	14 28	3.96	.705	.556	.488	.090	.130	.110	41.0	8.9	2.3	
3:03 a. m.	15 00	3.82	.688	.556	.488	.110	.140	.125	43.4	9.1	2.6	
2:50 a. m.	16 45	3.45	.968	.687	.579	.065	.097	.081	54.8	6.5	0.9	
Jan. 24, 1935												
1:09 a. m.	29 34	2.02	1.445	1.020	.802	.025	.014	.020	80.0	7.9	2.9	Pc
1:06 a. m.	29 46	2.01	1.458	1.020	.802	.027	.014	.020	80.2	8.3	3.5	

Atmospheric conditions during turbidity measurements

Jan. 2: Temperature −2°C; wind, NW. 12; polarization, 60 percent; blueness of sky, 6.
Jan. 3: Temperature, 3°C; wind, NW. 10; polarization, 58 percent; blueness of sky, 5.
Jan. 4: Temperature, 0° C; wind, NW. 8; polarization, 56 percent; blueness of sky, 5.
Jan. 5: Temperature, −1° C; wind, SE. 4.
Jan. 24: Temperature, −8° C; wind, NW. 12.

BLUE HILL OBSERVATORY OF HARVARD UNIVERSITY

Date and hour angle	Solar altitude	Air mass	I_m	I_y	I_r	β_{Im-r}	β_{Iy-r}	β_{mean}	$\frac{I_{w=0}}{1.94}$ (Percentage of solar constant)	$\frac{I_{w=0}-I_m}{1.94}$ (Percentage of solar constant)	w	Air-mass type
Jan. 2, 1935	° ′	*m*	*gr. cal.*	*gr. cal.*	*gr. cal.*						*mm*	
2:46 a. m.	14 24	3.97	1.105	0.870	0.748	0.057	0.073	0.065	62.8	7.7	3.4	Pc, NPp aloft.
2:24 a. m.	16 50	3.43	1.191	.916	.766	.044	.043	.044	64.4	5.0	3.6	
1:09 a. m.	22 54	2.56	1.352	1.012	.838	.043	.040	.042	71.1	3.7	4.5	
0:48 a. m.	23 53	2.46	1.381	1.029	.843	.038	.034	.036	73.2	4.4	4.4	
0:08 a. m.	24 48	2.37	1.396	1.032	.843	.036	.033	.034	74.7	5.1	5.2	
0:20 p. m.	24 39	2.39	1.401	1.034	.848	.035	.036	.036	74.0	4.2	4.9	
1:22 p.m.	22 07	2.64	1.362	1.009	.831	.032	.049	.040	71.0	3.1	4.1	
Jan. 3, 1935												
0:52 a. m.	23 43	2.48	.938	.682	.567	.097	.142	.120	55.6	8.8	5.5	NPp, NPc aloft.
0:30 a. m.	24 27	2.41	.972	.711	.594	.094	.143	.118	57.0	8.5	5.6	
0:24 p. m.	24 35	2.39	1.032	.757	.633	.094	.123	.108	59.2	7.8	5.6	
1:59 p. m.	19 16	3.00	.976	.717	.590	.067	.091	.079	69.2	4.8	4.1	
Jan. 4, 1935												
2:31 a. m.	16 18	3.53	1.259	.964	.816	.038	.047	.042	64.5	1.3	2.5	
2:00 a. m.	19 23	2.99	1.336	1.006	.852	.040	.053	.046	67.9	1.3	3.0	Pc
0:57 a. m.	23 42	2.48	1.390	1.023	.852	.035	.050	.042	71.2	1.9	3.9	
0:19 a. m.	24 52	2.36	1.428	1.042	.866	.033	.050	.042	72.7	1.5	3.9	Pc
2:01 p. m.	19 28	2.98	1.334	.994	.818	.026	.034	.030	72.5	6.0	4.3	
Jan. 5, 1935												
0:25 a. m.	24 52	2.36	1.261	.923	.757	.050	.061	.056	69.5	5.9	5.4	Pc, NPp aloft.
1:29 p. m.	24 44	2.38	1.238	.914	.747	.056	.070	.063	66.5	4.8	5.1	NPc
Jan. 11, 1935												
2:44 a. m.	15 35	3.68	.905	.707	.614	.090	.110	.100	49.0	3.9	3.2	NPp
2:24 a. m.	17 45	3.26	1.061	.829	.697	.074	.070	.072	58.6	5.7	3.9	
0:40 a. m.	25 16	2.33	1.281	.949	.768	.049	.042	.046	71.0	6.2	5.5	
0:21 a. m.	25 44	2.30	1.291	.954	.773	.048	.043	.046	72.2	7.9	5.9	
1:33 p. m.	22 25	2.61	1.290	.945	.772	.035	.047	.041	70.9	6.6	5.0	Pc & NPp
Jan. 12, 1935												
2:19 a. m.	18 28	3.13	1.202	.912	.760	.047	.052	.050	64.5	5.5	4.0	Pc
1:46 p. m.	21 32	2.71	1.392	1.014	.833	.019	.031	.025	74.7	5.3	4.6	
2:13 p. m.	19 04	3.03	1.348	1.000	.823	.022	.027	.024	72.3	5.5	4.1	Pc
Jan. 15, 1935												
2:32 a. m.	17 32	3.30	1.225	.937	.791	.044	.054	.049	63.1	1.9	3.0	Pc
1:02 a. m.	25 23	2.33	1.365	1.016	.837	.047	.048	.048	71.5	3.4	4.8	
1:58 p. m.	21 00	2.77	1.274	.941	.794	.046	.068	.057	66.5	2.7	3.9	NPp
2:08 p. m.	20 02	2.90	1.260	.940	.778	.039	.048	.044	67.3	4.5	4.1	NTp aloft

TABLE 3.—*Total, I_m, and screened, I_y, I_r, solar radiation intensity measurements, obtained during January 1935, and determinations of the atmospheric turbidity factor, β, and water-vapor content, w=depth in millimeters, if precipitated*—Continued

BLUE HILL OBSERVATORY OF HARVARD UNIVERSITY—Continued

Date and hour angle	Solar altitude	Air mass	I_m	I_y	I_r	$\beta_{I_{m-r}}$	$\beta_{I_{y-r}}$	β_{mean}	$\frac{I_{m-o}}{1.94}$ (Percentage of solar constant)	$\frac{I_{m-o}-I_m}{1.94}$ (Percentage of solar constant)	w	Air-mass type
Jan. 16, 1935												
2:57 a. m.	14 44	3.89	0.813	0.664	0.588	0.125	0.121	0.123	43.1	2.6	2.7	Pc
2:38 a. m.	17 01	3.39	.870	.688	.607	.125	.145	.135	44.8	1.4	2.7	
0:07 p. m.	26 45	2.22	1.213	.904	.755	.081	.093	.087	65.0	4.5	5.4	
0:27 p. m.	26 28	2.24	1.229	.923	.769	.079	.081	.080	65.7	4.4	5.3	NPc—Pc
2:08 p. m.	20 12	2.88	1.215	.916	.757	.048	.050	.049	66.8	5.2	4.3	
2:25 p. m.	18 28	3.13	1.200	.906	.752	.044	.050	.047	65.5	5.6	4.0	
Jan. 18, 1935												
0:58 p. m.	25 46	2.29	1.300	.941	.767	.046	.053	.050	71.3	6.5	5.7	NPc, T_A aloft
2:30 p. m.	18 17	3.16	1.134	.866	.708	.045	.043	.044	66.1	9.5	4.4	
Jan. 19, 1935												
2:37 a. m.	17 40	3.26	1.125	.864	.732	.062	.071	.066	60.1	4.0	3.6	
0:38 a. m.	26 45	2.22	1.318	.976	.781	.024	.027	.026	71.8	6.0	5.7	
0:02 p. m.	27 22	2.17	1.244	.908	.761	.044	.078	.061	70.0	7.9	6.2	
Jan. 24, 1935												
0:59 p. m.	27 00	2.20	1.314	.946	.764	.038	.045	.042	74.0	8.4	6.1	Pc, T_A aloft
1:20 p. m.	25 46	2.29	1.307	.941	.764	.033	.049	.041	73.6	8.3	5.9	
2:11 p. m.	21 28	2.71	1.244	.917	.745	.037	.041	.039	70.9	8.8	5.0	
Jan. 25, 1935												
1:34 a. m.	25 00	2.36	1.320	.964	.790	.041	.050	.046	69.6	3.7	4.9	Pc
0:16 p. m.	28 36	2.08	1.403	1.007	.831	.039	.047	.043	74.8	4.7	5.9	
0:39 p. m.	28 04	2.12	1.408	1.007	.831	.035	.045	.040	75.2	4.9	5.8	
2:06 p. m.	22 10	2.63	1.340	.929	.768	.014	.058	.036	71.1	5.1	4.7	Pc, NT_P aloft
Jan. 26, 1935												
2:35 a. m.	19 24	2.99	.817	.629	.544	.168	.160	.164	43.7	2.9	3.6	Pc, NT_P aloft
1:11 a. m.	26 49	2.21	.866	.666	.564	.170	.184	.177	49.5	6.7	5.9	
0:25 a. m.	28 44	2.08	.950	.708	.609	.157	.196	.176	52.3	4.9	5.9	
0:05 p. m.	28 58	2.00	.988	.742	.621	.149	.158	.154	56.2	6.9	6.6	
0:35 p. m.	28 26	2.10	.955	.703	.604	.143	.194	.168	53.1	5.4	5.9	Pc, NPc aloft
Jan. 27, 1935												
0:22 a. m.	29 00	2.06	1.424	1.023	.849	.040	.056	.048	72.7	1.5	4.5	Pc
0:45 p. m.	28 21	2.10	1.424	1.023	.849	.037	.062	.050	73.0	1.8	4.1	
1:06 p. m.	27 16	2.17	1.412	1.018	.839	.035	.052	.044	74.1	3.5	5.2	
2:36 p. m.	19 21	3.00	1.363	1.013	.845	.026	.039	.032	71.4	3.3	3.7	Pc
Jan. 28, 1935												
2:34 a. m.	19 50	2.93	1.229	.925	.776	.049	.061	.055	64.8	3.4	3.8	Pc
2:15 a. m.	21 57	2.66	1.275	.945	.781	.043	.050	.046	66.9	3.1	4.1	
0:21 a. m.	29 18	2.04	1.369	.978	.795	.038	.050	.044	72.2	3.7	5.5	Pc, NP_P aloft
Jan. 30, 1935												
2:12 a. m.	22 46	2.57	1.304	.976	.818	.070	.061	.066	65.5	.2	.1	Pc
0:13 p. m.	29 57	2.00	1.476	1.049	.867	.030	.054	.042	75.8	1.9	1.5	
0:33 p. m.	29 32	2.02	1.471	1.049	.860	.026	.044	.035	78.3	4.2	2.1	
2:04 p. m.	23 33	2.50	1.387	1.009	.811	.024	.018	.021	77.1	7.5	3.1	Pc
Jan. 31, 1935												
2:03 a. m.	23 52	2.46	1.360	.986	.817	.030	.048	.039	72.6	4.5	2.7	Pc
0:28 a. m.	29 56	2.00	1.444	1.036	.837	.027	.030	.028	79.0	6.7	3.7	
0:07 p. m.	30 16	1.98	1.429	1.036	.830	.032	.021	.026	79.7	8.2	4.0	
0:30 p. m.	29 53	2.00	1.444	1.031	.830	.0025	.027	.026	79.6	7.3	3.8	
2:06 p. m.	23 36	2.49	1.375	----------	.818	.029	----------	.029	75.0	6.2	3.0	
2:44 p. m.	19 20	3.00	1.275	.924	.768	.025	.050	.038	69.3	5.5	2.3	Pc

Atmospheric conditions during solar radiation measurements, Blue Hill Observatory of Harvard University

Date and time from apparent noon	Air temperature	Wind (Beaufort Scale)	Visibility (scale 0–10)	Sky blueness	Cloudiness and remarks
January 1935	°C.				
2; 2:41 a. m.	−10.0	W 6	7–9	5	1 Stcu, few Cu, light haze.
2; 1:05 a. m.	−8.3	W 7	8	5	Few Acu, few Cu, light haze.
2; 0:30 a. m.	−6.7	W 7	8	5	Few Acu, light haze.
2; 2:47 p. m.	−5.6	WNW 6	9	5	Few Cist, few Acu, few Cu.
3; 0:58 a. m.	+2.5	S 5	7	5	4 Ci, mod. water haze.
3; 1:39 p. m.	+5.7	SW 5	8	4	Few Cist, mod. water haze.
4; 2:19 a. m.	−15.6	NW 7	9	10	Few Frcu, light haze. Blue sky obs. hereafter made in sun.
4; 0:37 a. m.	−14.9	NW 7	9	10	Few Cist, few Frcu.
4; 2:05 p. m.	−13.3	W 5	9	12	Few Cist, few Frcu, light haze.
4; 3:25 p. m.	−12.2	WNW 3	9	------	Few Cist.
5; 1:06 p. m.	−3.5	S 4	8	12	7 Cist, few Cu. Prob. Cist over sun.
11; 2:49 a. m.	0.0	W 5	7	8	Few Acu, mod. water haze.
11; 0:35 a. m.	+2.2	W 6	9	9	1 Ci, 1 Cu, Frcu.
11; 1:39 p. m.	+2.8	W 7	9	8	2 Cicu, 4 Cu, Frcu.
12; 2:37 a. m.	−6.7	NW 4	8	9	Few Frcu in E, few Stcu. Cu in W.
12; 1:55 p. m.	−5.6	NW 8	9	9	1 Stcu, Cu.
15; 2:38 a. m.	−15.0	NW 5	7	9	Few Cist, Cicu.
15; 0:53 a. m.	−13.3	NW 5	8	10	3 Ci, Cist, increasing.
15; 1:55 p. m.	−9.4	WNW 5	9	11	Ci haze, 4 Acu.
16; 2:43 a. m.	−13.3	N 5	6	8	2 Acu, thick haze.
16; 1:23 a. m.	−11.1	N 5	6	9	No clouds, thick haze.
16; 0:11 p. m.	−8.9	NW 4	6	9	Do.
16; 2:11 p. m.	−7.2	NW 3	7	10	Few Cu, thick haze.
18; 0:34 p. m.	−2.2	NW 6	9	10	4 Cu, Stcu.
18; 2:21 p. m.	−7.2	NW 5	9	12	Few Cu, Frcu.
24; 1:01 p. m.	−11.7	NNW 6	8–9	4	1 Ci, Few Cu.
24; 2:17 p. m.	−11.7	NW 6	9	------	2 Ci, Acu, Stcu.
24; 3:59 p. m.	−12.8	NW 6	9	5	3 Ci, Acu, Stcu.
25; 2:28 a. m.	−20.6	WNW 5	9	10	1 Ci, Cist, light haze.
25; 1:50 a. m.	−19.4	WNW 5	9	10	3 Ci, Cist, light haze.
25; 0:22 p. m.	−16.1	WNW 5	9	10	2 Cist, Ci, light haze.
26; 1:28 a. m.	−8.3	SW 4	6	7	4 Acu, thick water haze.
26; 0:13 a. m.	−6.1	SW 4	6	8	2 Acu, thick water haze.
27; 2:17 a. m.	−20.8	NW 5	8–9	9	1 Acu, light haze.
27; 0:48 p. m.	−17.8	NW 5	9	11	Do.
27; 2:11 p. m.	−16.2	NW 4	9	11	1 Acu, no haze.
28; 2:30 a. m.	−20.2	N 3	7–9	------	2 Acu, Cicu.
29; 3:49 p. m.	−5.6	NWxW 3	6	7	4 Acu, heavy haze.
30; 2:30 a. m.	−18.9	NW 5	8	10	Few Ci.
30; 0:14 p. m.	−14.9	NW 5	8	5	Do.
30; 2:08 p. m.	−12.9	NW 4	8	5	Do.
31; 2:11 a. m.	−19.6	NWxN 4	7–8	11	Few Acu, few Frcu, mod. haze inversion.
31; 0:12 p. m.	−15.6	NW 4	8	11	Haze like Ci fum over sun, light haze.
31; 2:08 p. m.	−12.8	NW 3	8	11	No clouds, light haze.

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy, 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		Heliographic			Area		Total area for each day	Observatory
			Diff. in longitude	Longitude	Latitude	Spot	Group		
1935	h	m	°	°	°				
Jan. 1	15	12	+28.0	177.4	−21.0	------	123	123	U. S. Naval.
Jan. 2	11	34	−80.0	58.2	−31.0	------	154	------	Do.
			−70.0	68.2	−22.0	31	------	------	
			+41.0	179.2	−21.0	------	46	231	
Jan. 3	11	14	−67.0	58.3	−31.0	------	247	------	Do.
			+55.0	180.3	−21.0	------	62	309	
Jan. 4	11	12	−55.0	57.1	−31.0	------	185	185	Do.
Jan. 5	11	5	−41.0	58.0	−31.0	------	185	185	Do.

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time		Heliographic			Area		Total area for each day	Observatory
			Diff. in longitude	Latitude	Longitude	Spot	Group		
1935	h	m	°	°	°				
Jan. 6	13	15	−24.0	60.6	+29.0	9	------	------	Mt. Wilson.
			−22.0	62.6	−33.0	------	199	208	
Jan. 7	13	54	−15.0	56.1	−31.0	------	170	------	U. S. Naval.
			−8.5	62.6	+30.0	15	------	185	
Jan. 11	11	21	−85.0	294.8	−19.0	------	154	------	Do.
			+38.0	57.8	−31.0	93	------	247	
Jan. 12	11	24	−73.0	293.6	−18.5	------	340	------	Do.
			+51.0	57.6	−32.0	77	------	417	
Jan. 14	11	49	−45.5	294.6	−19.0	------	278	------	Do.
			+76.0	56.1	−33.0	46	------	324	
Jan. 15	13	45	−33.0	292.9	−20.0	------	123	123	Do.
Jan. 16	14	45	−23.0	289.1	−19.0	15	------	------	Do.
			−17.0	295.1	−20.0	------	93	108	
Jan. 17	14	20	−2.5	296.7	−21.0	------	100	100	Do.
Jan. 18	11	0	+8.0	295.8	−21.0	------	111	111	Mt. Wilson.
Jan. 19	14	25	+22.0	294.8	−22.0	------	26	26	Do.
Jan. 20	11	30	+33.0	294.2	−22.5	------	45	45	Do.
Jan. 21	11	30	+47.0	295.0	−23.0	14	------	14	Do.
Jan. 22	18	15	−71.0	160.2	+28.0	16	------	------	Do.
			+63.0	294.2	−23.0	5	------	21	
Jan. 23	13	10	−62.0	158.8	+29.0	------	86	------	Do.
			+11.0	231.8	−28.5	------	71	157	
Jan. 24	11	13	−50.0	158.7	+29.0	------	123	------	U. S. Naval.
			+24.0	232.7	−29.5	------	216	339	
Jan. 25	13	14	−37.5	157.0	+29.0	------	100	------	Do
			+39.0	233.5	−29.5	------	247	347	
Jan. 26	9	40	−24.0	159.4	+29.0	------	274	------	Harvard.
			+52.0	235.4	−31.0	------	373	647	
Jan. 27	13	28	−10.0	158.0	+29.0	------	93	------	U. S. Naval.
			+66.0	234.0	−29.0	------	154	247	
Jan. 28	11	14	+3.0	159.1	+29.5	62	------	------	Do.
			+81.0	237.1	−30.0	77	------	139	
Jan. 29	14	18	+17.5	158.7	+30.0	62	------	62	Do.
Jan. 30	11	11	+29.0	158.7	+30.0	62	------	62	Do.
Jan. 31	11	18	+40.0	156.5	+30.0	62	------	62	Do.
Mean daily area for 27 days								186	

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR JANUARY 1935

(Dependent alone on observations at Zurich and its station at Arosa)

[Data furnished through the courtesy of Prof. W. Brunner, Eidgenossische Sternwarte, Zurich, Switzerland]

January 1935	Relative numbers	January 1935	Relative numbers	January 1935	Relative numbers
1	35	11	*d* 19	21	7
2	*d*	12	------	22	14
3	27	13	24	23	*ad* 6
4	------	14	------	24	31
5	------	15	16	25	32
6	21	16	16	26	31
7	*a* 19	17	*a* 14	27	26
8	11	18	12	28	*a* 24
9	11	19	10	29	------
10	9	20	9	30	9
				31	10

Mean, 25 days=18.1.

a=Passage of an average-sized group through the central meridian.
d=Entrance of a large or average-sized center of activity on the east limb.