Radio station	Call signals	Range		Weather Bureau office
		Day	Night	
Palm Beach, Fla	WOE	600	1,800	Miami.
Tampa, Fla	WPD	400	1,000	Tampa.
Port Arthur, Tex	WPA	600	1,600	Port Arthur.
Galveston, Tex	WGV	300	900	Galveston.

For several years the South Puerto Rico Sugar Co., through its radio station at Ensenada (call letters WPR) has been cooperating with the Weather Bureau by sending general calls out to ships for weather reports when a hurricane had been reported or when there were indications of a tropical storm, and by relaying weather reports from ships which could not communicate directly with main land stations. This service has been of inestimable value to forecasters of the Weather Bureau at San Juan and Washington in the issuing of hurricane warnings and advices. The South Puerto Rico Sugar Co. will continue this cooperation and participate in the program by making direct calls for reports from ships in designated zones.

When reports are needed from any zone or from more than one zone, a message will be sent to the appropriate local Weather Bureau official, stating the zones and the times for which observations are desired. The official in charge of the Weather Bureau office will immediately advise the radio operator. The radio operator will then send messages direct to ships in the zone from which reports are desired, requesting that weather observations taken at specified hours be forwarded by radio to the Weather Bureau office at Washington.

As an added effort to provide the best possible service to the people, and to the business and shipping interests, it is planned to provide Weather Bureau officials in charge of stations on the South Atlantic and Gulf coasts with weather reports from ships whenever a hurricane is in progress and there is any probability of the sections in which the stations are located being affected by the storm. Such reports, in addition to the land station observations and the advisory and warning messages issued from Washington, will be helpful to local Weather Bureau officials in giving service.

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:

Aimes, A.
Météoropathologie. Paris. 1932. 219 p. 23 cm.

Champly, René.
Les moteurs à vent; théorie, construction, montage, utilisation au puisage de l'eau et à la production de l'électricité. Paris. 1933. vii, 270 p.. illus. diagrs. 25½ cm.

Ekhart, E.
Ein interessanter Nebeleinbruch. p. 481–487. figs. pl. 26 cm. (Sonderdr.: Der Bergsteiger, Nr. 8, Mai 1933.)

Eredia, Filippo.
Le condizioni meteorologiche generali sulla aviolinea Milano-Roma. Roma. 1933. 19 p. figs. 25 cm. (Estr.: Rivista aeron., Anno 9, N. 1. Genn. 1933-XI.)
Disposizioni per i sondaggi notturni con palloni piloti. Roma. 1933. 8 p. figs. 24½ cm. (Estr.: Rivista aeronautica. Anno 8, N. 12. Dic. 1932-X.)
Lo scirocco in Italia. Roma. 1933. 22 p. figs. 32 cm. (Annali Uff. presagi. v. 5, 1932-XI.)

Johansson, Osc. V.
Die Beaufortskala in einfachen Formeln und Gedächtnisregeln. Helsingfors. 1933. 26 p. 24 cm. (Mitt. met. Inst. Univ. Helsingfors. N:0 23.)

Kadel, B. C.
Airport weather station. Do you know how to equip one for your port? p. 50–51. illus. 30 cm. (Airports. Washington, N.J. v. 4, Apr., 1930.)

Kidson, E.
Wairarapa floods of August, 1932. Wellington. 1933. p. 220–227. figs. 25½ cm. (Met'l office note no. 13.) (Extr.: New Zealand journ. sci. & tech., v. 14, no. 4, 1933.)

Kinoshita, M., & Uchiyama, K.
On the size of fog droplets. Tokyo. 1932. p. 144–147. figs. 26½ cm. (Sci. papers Inst. phys. & chem. res. no. 391. v. 19, 1932.)

Millas, José Carlos.
Memoria del huracán de Camagüey de 1932. Habana. 1933. 64 p. figs. 23½ cm.

National research council. Committee on hydrodynamics.
Report of the committee on hydrodynamics . . . Washington. 1932. 634 p. diagrs. 25 cm. (Bulletin Nat. research council. no. 84, Feb., 1932.)

Nunn, Roscoe.
Are you on chummy terms with the weather man? p. 5–6. 29 cm. (Southern florist. April 21, 1933.)

Sanson, Joseph.
L'Atmosphère et l'agriculture. Paris. 1932. 146 p. illus. maps. diagrs. 19 cm.

Schonland, Basil F. J.
Atmospheric electricity. London. [1932.] vii, 100 p. illus. diagrs. 17½ cm.

Theaman, John R.
Extreme weather records. [Indianapolis.] 1932. 44 p. 16 cm. (Extracts from gov't met'l pubs. Dec., 1932.)

Vanièr, Joseph F.
Dictionary of aeronautical terms in abridged form, German-English-French; French-English-German. New York. [c1929.] 141 p. 20½ cm.

SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING MAY 1933

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January 1932, REVIEW, page 26.

Table 1 shows that solar radiation intensities averaged above normal for May at all three stations at which normal incident measurements are made.

Table 2 shows a deficiency in the total solar radiation received on a horizontal surface at Madison, Lincoln, La Jolla, Gainesville and Miami, and an excess at all other stations.

May was unusually cloudy throughout the United States and particularly so along the Atlantic Seaboard. Hence but few turbidity measurements were possible at Washington, and those obtained on May 18, the best day of the month, indicate that even then the sky was rather turbulent.

Polarization observations obtained at Washington on 2 days give a mean of 55 percent with a maximum of 56 percent on the 18th. At Madison, observations obtained on 4 days give a mean of 59 percent with a maximum of 70 percent on the 3d. These values are close to the May normals for the respective stations.

TABLE 1.—*Solar radiation intensities during May 1933*

[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*
May 4	6.50					1.52					5.79
May 18	8.48	0.59	0.74	0.91	1.07	1.29					6.76
May 27	17.37			.82							18.59
May 29	14.60				0.97	1.29					14.10
Means		(.59)	(.74)	(.86)	(1.02)	1.37					
Departures		−.04	+.03	+.04	+.03	+.08					
Madison, Wis.											
May 3	4.37			1.19	1.35	1.49					4.95
May 4	4.37				1.20						5.56
May 16	9.47					1.48					8.81
May 17	10.21					1.34					11.38
May 19	13.13					1.52					12.24
May 25	8.48				1.07						7.04
May 31	10.59				1.02	1.39					10.59
Means				(1.19)	1.16	1.44					
Departures				+.16	+.05	+.08					

TABLE 1.—*Solar radiation intensities during May 1933*—Continued

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*
May 14	7.09		.84	.99	1.19	1.40					6.27
May 18	14.60			.79	1.01	1.32					14.60
May 19	16.20								0.65	0.50	15.11
May 23	9.47						1.10	0.81	.65		7.87
May 24	7.29					1.40	1.07	.84			5.56
May 26	8.18			1.01	1.16	1.44					8.18
May 27	9.14			1.03	1.21	1.48					9.47
May 31	9.14			1.03	1.20	1.38	1.15	.93	.80		9.83
Means			(.84)	.97	1.15	1.40	1.08	.86	.70	(.50)	
Departures			+.05	+.04	+.03	+.02	−0.02	−.04	−.12	−.21	
Blue Hill, Mass.											
May 2	11.8					1.39	1.20				11.8
May 4	4.6				1.41	1.49	1.17				4.7
May 5	2.6				1.34	1.53					3.2
May 7	4.6					1.45					4.0
May 12	8.5				1.10	1.23	.77				8.5
May 15	3.4					1.44	1.24				5.0
May 16	4.6					1.41	1.17				5.2
May 17	4.2					1.42	1.10				5.1
May 18	5.4				1.18	1.42	1.07				6.3
May 19	8.2				1.15	1.32	.94				8.4
May 22	9.5					1.42	1.17				6.8
Means					1.24	1.41	1.09				

[1] Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Pittsburgh	Fairbanks	Twin Falls	La Jolla	Gainesville	Miami	New Orleans
	Gram calories per square centimeter												
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
April 30	418	295	233	277	415	644	150	262	464	424	450	505	330
May 7	263	244	319	345	316	522	207	405	373	424	530	499	422
May 14	520	512	711	446	487	698	359	401	550	474	528	442	482
May 21	576	492	598	419	481	682	448	525	685	426	621	572	464
May 28	519	570	638	529	362	676	521	412	607	313	565	525	580
	Departures from weekly normals												
April 30	−40	−149	−243	−86	+37	+63	−5		+54	+12	−134	−29	
May 7	−173	−201	−133	−29	−54	−86	+20		+196	±0	−68	−51	
May 14	+54	+40	+182	+51	+102	+63	+12		+68	+35	−77	−104	
May 21	+74	+5	+40	−4	+73	+17	−35		−47	−28	+31	+50	
May 28	+3	+76	+123	+08	−54	+6	+10		+9	−135	+22	+17	
	Accumulated departures on June 3												
	+3,850	+5,187	−406	+3,773	+3,570	+3,703	+665		+1,710	−4,641	−9,576	−2,464	

TABLE 3.—*Solar radiation measurements, and determinations of atmospheric turbidity factor, β, Washington, D.C., May 1933*

[Values in italics have been interpolated]

Date and solar hour angle	Solar altitude, *h*.	Air mass, *m*.	I_m	I_y	I_r	*β*	Blueness of sky	Atmospheric dust particles per cubic centimeter	Notes: (skylight polarization, P.) clouds, etc.
May 18			*gr. cal.*	*gr. cal.*	*gr. cal.*				
5:43a	15–29	3.70	0.776	0.593	*0.510*	0.090		727	
5:39a	16–05	3.58	.812	*.596*	.514	.080			
5:26a	18–34	3.12	.888	*.664*	.539	.070			
5:20a	19–44	2.95	.914	.667	*.543*	.068			
5:01a	23–26	2.51	.990	.706	*.570*	.070			
4:57 a	24–12	2.43	.997	*.711*	.573	.072			
3:51 a	37–04	1.65	1.141	*.818*	.648	.105	5		P=56.4%
3:44 a	38–22	1.61	1.139	.818	*.651*	.115			

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, Superintendent United States Naval Observatory. Data furnished by Naval Observatory, in cooperation with Harvard, Perkins, and Mount Wilson observatories. The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column]

Date	Eastern standard civil time		Heliographic			Area		Total area for each day
			Diff. long.	Longitude	Latitude	Spot	Group	
1933	*h.*	*m.*	°	°	°			
May 1 (Naval Observatory)	11	0	No spots			------	------	------
May 2 (Naval Observatory)	10	38	No spots			------	------	------
May 3 (Mount Wilson)	9	30	No spots			------	------	------
May 5 (Naval Observatory)	10	29	No spots			------	------	------
May 6 (Mount Wilson)	9	30	No spots			------	------	------
May 7 (Naval Observatory)	13	29	No spots			------	------	------
May 9 (Mount Wilson)	9	17	−22.0	158.4	−6.0	------	6	6
May 12 (Mount Wilson)	11	5	+8.0	147.6	−13.0	------	4	4
May 13 (Naval Observatory)	13	8	No spots			------	------	------
May 14 (Naval Observatory)	11	11	No spots			------	------	------
May 15 (Mount Wilson)	13	0	No spots			------	------	------
May 16 (Naval Observatory)	14	7	No spots			------	------	------
May 17 (Naval Observatory)	14	39	No spots			------	------	------
May 18 (Naval Observatory)	11	34	+12.0	72.0	+7.0	------	12	12
May 19 (Naval Observatory)	10	38	+22.0	69.3	+12.0	------	25	25

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time		Heliographic			Area		Total area for each day
			Diff. long.	Longitude	Latitude	Spot	Group	
1933	*h.*	*m.*	°	°	°			
May 20 (Naval Observatory)	12	23	+36.0	69.1	+12.0	------	46	46
May 21 (Naval Observatory)	10	34	+49.0	69.9	+12.0	------	46	46
May 22 (Naval Observatory)	11	13	+63.0	70.3	+12.0	------	93	93
May 23 (Naval Observatory)	11	26	−26.0	327.9	+9.0	------	28	------
			+76.0	69.9	+12.0	------	93	121
May 24 (Naval Observatory)	10	19	−15.0	326.3	+10.0	------	12	12
May 26 (Mount Wilson)	12	30	+40.0	353.6	+11.0	6	------	6
May 27 (Naval Observatory)	10	20	No spots			------	------	------
May 28 (Naval Observatory)	11	35	No spots			------	------	------
May 29 (Naval Observatory)	13	56	No spots			------	------	------
May 31 (Mount Wilson)	9	26	No spots			------	------	------
Mean daily area for May	------		------	------	------	------	------	15

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR MAY 1933

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

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

May 1933	Relative numbers	May 1933	Relative numbers	May 1933	Relative numbers
1	0	11	0	21	12
2	8	12	0	22	11
3	0	13	0	23	17
4	0	14	0	24	12
5	0	15	0	25	8
6	0	16	0	26	0
7	0	17	------	27	------
8	0	18	0	28	0
9	8	19	8	29	------
10	8	20	12	30	0
				31	0

Mean: 28 days=3.7.

AEROLOGICAL OBSERVATIONS

[Aerological Division, W. R. Gregg, in charge]

By L. T. SAMUELS

Free-air temperatures during May were considerably above normal at the stations shown in table I, except at Norfolk where they were close to normal. Notwithstanding the positive temperature departures, those of relative humidity were likewise positive at most stations.

In most cases the free-air resultant wind velocities for the month exceeded the normals, except in the upper Mississippi Valley and Upper Lakes region where they were below normal. Resultant wind directions were, in general, close to normal, except in the southern section where a preponderance of southerly winds occurred.

Upper-air observations were discontinued on April 30, 1933, at Ellendale incident to closing the station on June 30. Hence all the data given in table I are based on airplane observations.