POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time		Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1939	*h*	*m*		°	°	°	°				
Aug. 25	11	51	6581	−49	23	−12	51	194	11	VG	Mt. Wilson.
			6582	−42	30	−13	56	73	15		
			6579	−3	69	+13	7	242	13		
			6580	−2	70	−21	27	6	4		
			6583	+30	102	−13	36	48	6		
			6576	+42	114	+13	41	145	8		
			6577	+46	118	−32	56	97	1		
			6576	+52	124	+13	61	533	8		
					(72)	(+7)		1,338	66		
Aug. 26	11	40	6585	−73	345	−17	70	436	17	VG	U. S. Naval.
			6584	−60	358	+7	60	24	5		
			(*)	−55	3	−5	54	24	5		
			6581	−34	2[illegible]	−12	37	218	16		
			6582	−28	30	−13	33	97	10		
			6579	+10	68	+13	12	242	12		
			6580	+13	71	−21	29	12	7		
			6576	+53	111	+16	53	48	12		
			6576	+55	113	+12	35	133	3		
			6577	+59	117	−32	65	97	1		
			6576	+66	124	+12	64	582	10		
					(58)	(+7)		1,913	98		
Aug. 27	9	14	6586	−67	340	−9	68	242	19	VG	Mt. Wilson.
			6585	−60	347	−17	62	679	46		
			6584	−47	0	+7	47	36	8		
			6581	−22	25	−12	27	145	25		
			6582	−16	31	−12	25	97	21		
			6579	+23	70	+13	22	145	9		
			6576	+66	113	+12	65	97	4		
			6577	+69	116	−32	73	97	5		
			6576	+79	126	+12	77	388	6		
					(47)	(+7)		1,926	143		
Aug. 28	11	4	6587	−80	312	−8	79	97	2	F	Do.
			6586	−52	340	−9	53	242	16		
			6585	−47	345	−16	50	582	48		
			6581	−9	23	−12	19	48	18		
			6582	−2	30	−11	17	12	8		
			6579	+37	69	+13	37	121	6		
			6576	+80	112	+12	78	73	3		
					(32)	(+7)		1,175	101		
Aug. 29	11	0	6587	−67	312	−8	65	109	2	VG	U. S. Naval.
			(*)	−61	318	+14	72	24	4		
			6585	−43	336	−16	47	12	1		
			6586	−42	337	−9	43	242	2		
			6586	−35	344	−8	36	145	13		
			6585	−33	346	−16	39	1,212	55		
			6581	+7	26	−12	19	48	8		
			6581	+11	30	−9	18	12	2		
			6579	+52	71	+13	52	194	3		
					(19)	(+7)		1,998	90		
Aug. 30	11	0	6587	−53	313	−8	52	97	5	G	Do.
			6586	−28	338	−9	32	242	3		
			6586	−23	343	−8	26	242	22		
			6585	−18	348	−16	27	1,454	70		
			6589	−13	353	+7	12	36	7		
			6589	−8	358	+7	8	24	5		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time		Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1939	*h*	*m*		°	°	°	°				
Aug. 30	11	0	6588	−8	358	+27	23	97	14	G	U. S. Naval.
			(*)	+26	32	−8	27	12	4		
			6579	+66	72	+13	64	194	3		
					(6)	(+7)		2,398	133		
Aug. 31	11	3	6591	−81	272	+5	81	145	1	VG	Do.
			6587	−41	312	−8	43	145	13		
			6586	−15	338	−8	20	194	14		
			6586	−9	344	−8	16	194	45		
			6585	−6	347	−15	22	2,036	74		
			6589	0	353	+7	0	12	3		
			6588	+3	356	+29	23	12	4		
			6588	+7	0	+27	24	48	5		
			6590	+44	37	−5	45	6	1		
			6579	+79	72	+13	78	145	4		
					(353)	(+7)		2,937	164		

Mean daily area for 31 days=2,589.
* Not numbered.
Plate quality: P, poor; F, fair; G, good: VG, very good.

PROVISIONAL SUNSPOT RELATIVE NUMBERS FOR AUGUST 1939

[Dependent alone on observations at Zurich]

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

August 1939	Relative numbers	August 1939	Relative numbers	August 1939	Relative numbers
1	*Ecd* 67	11	*aa* 157	21	*b* 94
2	78	12	*Mac* 170	22	86
3	*Maac* 73	13	*ad* 159	23	*d* 72
4	94	14	*a* 138	24	75
5	*a* 90	15	*Macd* 146	25	*a* 58
6	*d* 112	16	122	26	*d* 69
7	*Mbc* 106	17	128	27	*Ec* 86
8	*Edd* 141	18	111	28	85
9	157	19	*a* 110	29	69
10	*d* 157	20	*d* 104	30	*Mc* 76
				31	*b* 95

Mean, 31 days=105.8

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE, in charge]

By B. FRANCIS DASHIELL

Upper-air observations made during August by airplanes and radiosonde are given in tables 1 and 1a, respectively, while those made by pilot balloons are shown in tables 2 and 3. The resultant winds, as well as the mean free-air pressures and temperatures, are shown on charts VIII, IX, X and XI. Isentropic data are given on chart XII and the mean altitudes of the identified tropopauses are shown in table 4. Detailed explanations of these charts and tables will be found in the January 1939 issue of the MONTHLY WEATHER REVIEW.

Table 1 shows that airplane observations are made at 7 stations in the United States. These observations failed to indicate any unusual pressure, temperature or humidity means for August. The highest temperatures prevailed at 1.5, 3, 4 and 5 kilometers on the Pacific coast (Seattle, Wash., and San Diego, Calif.). Mean pressure was highest over Pensacola, Fla., at 1.5 and 3 kilometers, and over San Diego, Calif., at 4 and 5 kilometers. Humidities were highest over Lakehurst, N. J., and Washington, D. C., and lowest over Seattle, Wash.

The radiosonde observations given in table 1a, as well as the airplane flights in table 1, show that below-zero mean temperatures were not encountered until nearly 5 kilometers was reached over all stations, except Miami, Fla. At 5 kilometers lowest mean temperatures occurred over Billings, Mont. (−5.3° C.), while the highest was over Miami, Fla. (+0.8° C.). But above 5 kilometers, where all observations are made by radiosonde (table 1a), the lowest mean temperatures were found at the 16-kilometer level, except at 15 kilometers over Omaha, Nebr.,

and 17 kilometers at San Juan, P. R. Mean minimum temperatures for August were found over El Paso, Tex. (−72.1° C.), San Juan, P. R. (−70.2° C.), Albuquerque, N. Mex. (−70.1° C.), and Phoenix, Ariz. (−70.0° C.). These were slightly lower than the minima recorded at more northern stations during the current month as well as in August 1938. Individual radiosonde observations showed that temperatures colder than −75.0° C. were recorded over San Juan, P. R., Washington, D. C., El Paso, Tex., and Albuquerque, N. Mex.

August resultant-wind directions and forces, based on 5 a. m. (Eastern standard time) observations made at 1.5 and 3 kilometers, and 5 p. m. observations at 4 and 5 kilometers, are shown on charts VIII, IX, X and XI, respectively. West of the Mississippi practically all pilot-balloon stations reached maximum altitudes of 10 kilometers or more, while 20 percent of all stations in the United States reported individual ascents that exceeded 15 kilometers. In the latter group many of these stations were located along a belt reaching from Texas to North Dakota. At Abilene, Tex., and Omaha, Nebr., individual flights exceeded 20 kilometers, and over Florida, eastern Colorado, Wyoming and Montana, all stations reached 15 kilometers or more. East of the Mississippi, except in Florida and a portion of the Ohio Valley, New England and the middle Atlantic States area, maximum altitudes for August failed to exceed 10 kilometers. The 13th and 14th of the month appeared favorable for high observations in the West, and the 15th and 17th in the East.

Individual wind speeds encountered during August above 15 kilometers were not unusual. The greater wind velocities were confined to the lower levels, as shown in table 3. Highest velocities reported between 15 and 26 kilometers were: 27, 18, 10, 15, 21, 17, 11, 14, 12, 13, 14 and 20 meters per second, respectively. A number of these observations indicated that winds having easterly components existed above 15 kilometers. This was particularly true above Abilene, Tex., between 16 and 26 kilometers. Upper-air wind observations covering the Southeast and Gulf States, as well as New Mexico, Arizona and southern California, showed that easterly winds persisted at the maximum altitudes reached. Similar conditions also were observed farther north, over Omaha, Nebr., and Huron, S. Dak.

The 5 a. m. (Eastern standard time) resultant-wind directions at 1.5 kilometers, as shown on chart VIII, were southwesterly over the greater portion of the United States. However, northwesterly winds were recorded over Atlanta, Ga., Birmingham, Ala., and Jackson, Miss., which appeared to be indications of the belt of northwesterly winds existing above at 3, 4, and 5 kilometers. Southeasterly winds prevailed over southern Texas, but directions were somewhat confused over the Pacific States, where velocities were light. Rather high resultant velocities were noted at 1.5 kilometers over the East, except for an area embracing Atlanta, Ga., Birmingham, Ala., Mobile, Ala., and New Orleans, La. High resultant velocities were recorded over Texas and Oklahoma; the extreme for the United States being 9.3 meters per second at Amarillo, Tex. Very low velocities of 1 meter per second or less were reported from the Pacific Northwest and southern California.

At 3 kilometers the resultant winds, based on 5 a. m. observations and shown on chart IX, indicated considerable change from those at 1.5 kilometers (chart VIII). A wide belt of northwesterly winds stretched across the country diagonally from Montana to Georgia, while westerly winds prevailed generally over the Northeast and the central Rocky Mountain region. Elsewhere southerly and southwesterly winds occurred, except southeasterly over Texas and Key West, Fla. A sharp line of demarcation between these southeasterly and northwesterly winds was located over northern and eastern Texas and western Louisiana. The resultant velocities over the south-central States, which were greatest at 1.5 kilometers, became the lowest for the country at 3 kilometers. High wind velocities occurred along the northern border, reaching maximum speeds of 7.5 and 8.2 meters per second at Havre, Mont., and Sault Ste. Marie, Mich., respectively. Relatively high velocities were noted over the Pacific and Atlantic coasts, the far Northwest, the Dakotas and the northeastern States.

Chart X shows the resultant winds at 4 kilometers, but based on 5 p. m. (Eastern standard time) observations. As also shown on chart IX for 3 kilometers, the belt of northwesterly winds stretching across the country to the Gulf coast and Georgia was flanked by a smaller area of southeasterly winds over Texas. Southwesterly winds occurred over the far West, the Southeast, and New England. Resultant velocities were highest over the north-central States from Montana to Michigan, and for the entire country over Des Moines, Iowa, and Omaha, Nebr. (9.8 and 10.0 meters per second, respectively).

At 5 kilometers, as shown on chart XI, the predominating winds over most of the United States came from the northwest quadrant, except along the Atlantic and Pacific coasts, Florida, southern Texas, and Arizona. Winds from the northeast quadrant occurred over a narrow belt from Abilene, Tex., to Birmingham, Ala. Easterly resultant winds persisted over southern Texas at 5 kilometers and continued in individual cases to 26 kilometers. Resultant velocities at 5 kilometers were high over the northern and eastern sections of the United States except in the far Northwest and lower Great Lakes region. The extreme Southwest reported low resultant velocities, being less than 1 meter per second at Winslow, Ariz. The highest velocities occurred over Havre, Mont. (11.0 meters per second), Bismarck, N. Dak. (11.0 meters per second), Fargo, N. Dak. (11.3 meters per second), and Des Moines, Iowa (10.7 meters per second). Velocities were somewhat lower over the East, ranging from 10.5 meters per second at Sault Ste. Marie, Mich., and 8.8 meters per second at Detroit, Mich., to 7.9 meters per second at Albany, N. Y.

Comparing the 5 a. m. August resultant-wind directions and velocities at 1.5 and 3 kilometers with 5 a. m. normals for 24 stations in the United States, it was found that large variations occurred over Medford, Oreg. (departure of 147° by a clockwise rotation from normal), Atlanta, Ga. (37° clockwise), and Nashville, Tenn. (25° counterclockwise), at 1.5 kilometers; and over Oklahoma City, Okla. (68° clockwise), Houston, Tex. (41° clockwise), and Billings, Mont. (40° clockwise), at 3 kilometers. Normal current directions were noted over Oklahoma City, Okla., at 1.5 kilometers, and Atlanta, Ga., St. Louis, Mo., and Fargo, N. Dak., at 3 kilometers. Departures from normal at 1.5 kilometers were by counterclockwise rotations, except over the Gulf and southeastern States and the far Northwest and Pacific coast where the departures were clockwise. At 3 kilometers all current departures of direction from normal by counterclockwise rotations were confined to the north-central and northeastern States.

Resultant velocities for August were less than normal at 1.5 kilometers over the entire country, except Billings, Mont., Sault Ste. Marie, Mich., and Oklahoma City, Okla. Outstanding negative departures occurred along the north Atlantic coast (Washington, D. C., −2.3 meters per second, and Boston, Mass., −2.2 meters per second), while Chicago, Ill., and Houston, Tex., showed normal

resultant velocities during August. At 3 kilometers velocities were less than normal except on the Pacific coast (Seattle, Wash., +1.3 meters per second) and along a belt extending from the Southwest to St. Louis, Mo. (+1.2 meters per second). The greatest negative velocity departure occurred at Boston, Mass. (−5.0 meters per second), while the largest positive departure was noted at Oklahoma City, Okla. (+1.5 meters per second). August resultant velocities at 3 kilometers over Atlanta, Ga., and Billings, Mont., were normal.

Although normal winds have been computed from morning observations only, a comparison of the 5 p. m. winds for August with corresponding 5 a. m. normals indicated that the departures in direction at 4 kilometers were by clockwise rotations over the Southwest and Southeast at 5 kilometers. Large departures of current direction from normal were noted at Oklahoma City, Okla. (139° counterclockwise), Houston, Tex. (124° counterclockwise), and Atlanta, Ga. (40° clockwise), at 4 kilometers; and over Albuquerque, N. Mex. (163° clockwise), Oklahoma City, Okla. (82° counterclockwise), and Houston, Tex. (153° counterclockwise), at 5 kilometers. The 5 p. m. resultant wind velocities for August were less than normal at 4 kilometers, except over the Central States at 4 kilometers; and greater than normal everywhere except over Seattle, Wash., Houston, Tex., and Cincinnati, Ohio, at 5 kilometers.

When the 5 p. m. winds for August were compared with the 5 a. m. normals for *all* levels above the surface up to 5 kilometers at 19 selected stations, it was found that Cincinnati, Ohio, Omaha, Nebr., Chicago, Ill., Fargo, N. Dak., and Nashville, Tenn. (in the same general area), had wind directions that were nearly normal. The greatest departures were noted over the West, being centered at Albuquerque, N. Mex., Salt Lake City, Utah., Seattle, Wash., Billings, Mont., Oakland, Calif., and Cheyenne, Wyo. At Albuquerque, N. Mex., the current winds departed by 71°, 22°, 126°, 116°, and 163° with clockwise rotations from normal at 2, 2.5, 3, 4, and 5 kilometers, respectively, and at Salt Lake City, Utah, by 150°, 130°, 154°, 42°, 26°, and 22°, by clockwise rotations, at 1.5, 2, 2.5, 3, 4, and 5 kilometers, respectively. Resultant velocities that were less than normal were outstanding at Fargo, N. Dak., Cincinnati, Ohio, Houston, Tex., Salt Lake City, Utah, St. Louis, Mo., and Washington, D. C., at all levels, but at Medford, Oreg., and Oakland, Calif., departures were greater than normal.

Table 2 shows the 5 p. m. (Eastern standard time) resultant winds for all levels where computed. Comparing these for 1.5 kilometers with the winds at 5 a. m. (Eastern standard time) for August it was noted that the 5 p. m. wind directions turned away from the morning winds by clockwise rotations over the East, Southeast, and central Rocky Mountains. Elsewhere the afternoon directions showed diurnal changes by assuming counterclockwise rotations from the morning directions. However, at 3 kilometers, the 5 p. m. winds having counterclockwise departures from the 5 a. m. directions were located over the lower Mississippi valley, the Northeast and the far Northwest. At 1.5 kilometers the 5 p. m. resultant-wind velocities over the country were lighter than those occurring in the morning except in the Northwest, but at 3 kilometers the afternoon velocities were higher at all places except over the Great Lakes region, the south Atlantic coast, and Texas.

Table 3 shows the maximum individual wind velocities during August. The wind speed of 40.4 meters per second over Wichita, Kans., was the highest to be reported from below 2.5 kilometers during recent years. The maximum velocities over Ely, Nev., and Huron, S. Dak. (40.7 and 58.0 m. p. s., respectively), between 2.5 and 5 kilometers, and above 5 kilometers, respectively, were the lowest wind speeds recorded in those levels during the preceding 12 months.

TABLE 1.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in ° C., and relative humidities (R. H.) in percent obtained by airplanes during August 1939*

Stations and elevations in meters above sea level	Altitude (meters) m. s. l.																													
		Surface			500			1,000			1,500			2,000			2,500			3,000			4,000			5,000		
	Number of observations	Pressure	Temperature	Relative humidity	Pressure	Temperature	Relative humidity	Pressure	Temperature	Relative humidity	Pressure	Temperature	Relative humidity	Pressure	Temperature	Relative humidity	Pressure	Temperature	Relative humidity	Pressure	Temperature	Relative humidity	Pressure	Temperature	Relative humidity	Pressure	Temperature	Relative humidity
Billings, Mont. (1,090 m.)	31	892	17.0	48	----	----	----	----	----	----	851	20.6	39	803	17.4	39	757	13.7	40	712	9.8	42	631	2.1	48	556	−5.3	52
Coco Solo, C. Z.[1] (15 m.)	27	1,009	26.5	92	956	24.6	86	904	22.3	84	853	19.9	83	804	17.8	74	759	15.5	72	715	13.2	64	634	7.8	66	----	----	----
Lakehurst, N. J.[1] (39 m.)	26	1,010	21.4	90	957	22.4	74	904	20.0	71	853	16.9	75	804	14.3	71	758	11.9	66	714	9.1	64	632	4.0	55	559	−1.1	45
Norfolk, Va.[1] (10 m.)	27	1,016	23.0	89	961	23.1	69	907	20.2	70	856	17.1	71	807	14.1	70	760	11.0	66	716	7.9	66	634	2.2	63	559	−3.6	56
Pearl Harbor, T. H.[1] (6 m.)	31	1,014	23.4	77	958	20.5	78	904	16.5	81	853	13.9	77	803	12.1	64	757	11.0	43	713	8.9	32	630	2.3	24	----	----	----
Pensacola, Fla.[1] (13 m.)	26	1,015	22.7	97	960	23.7	69	906	20.5	65	855	17.7	62	806	14.9	59	760	12.2	54	716	9.4	53	634	3.9	50	560	−1.4	47
St. Thomas, V. I.[1] (8 m.)	31	1,016	28.2	76	962	24.2	90	908	21.3	86	857	18.3	82	809	15.7	80	762	13.2	74	718	10.6	66	636	5.3	58	562	−0.2	54
San Diego, Calif.[1] (10 m.)	31	1,011	21.2	81	956	19.0	84	903	24.3	49	852	25.1	33	805	22.6	33	759	19.0	34	716	15.0	37	635	7.0	43	561	−1.2	46
Seattle, Wash.[1] (10 m.)	24	1,016	18.8	65	961	15.8	66	906	16.1	51	855	14.6	45	805	12.8	33	758	10.2	30	713	8.0	28	630	2.1	24	557	−4.6	30
Spokane, Wash. (597 m.)	31	945	16.1	46	----	----	----	902	22.1	34	851	19.2	32	803	15.4	34	757	11.5	36	712	8.3	35	630	1.5	36	556	−5.5	40

[1] Navy.

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.
NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

TABLE 1a.—*Mean free-air barometric pressures (P.) in mb., temperatures (T) in °C., and relative humidities (R. H.) in percent obtained by radiosondes during August 1939*

Stations and elevations in meters above sea level

Altitude (meters) m. s. l.	Albuquerque, N. Mex. (1,620 m.)				Denver, Colo. (1,616 m.)				Ely, Nev. (1,194 m.)				Nashville, Tenn. (180 m.)				Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (300 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	841	20.2	56	31	841	16.6	58	31	812	13.8	48	31	994	21.1	87	31	1,014	14.7	86	31	968	22.8	74	31	979	19.6	78
500													31	958	22.4	74	31	958	14.5	81	31	956	24.0	67	31	957	20.4	68
1,000													31	904	20.1	73	31	903	21.9	40	31	904	23.2	55	31	904	19.8	60
1,500													31	853	17.1	77	31	853	21.4	28	31	853	21.1	56	31	852	17.6	57
2,000	31	804	19.5	51	31	804	17.9	50	31	804	16.9	44	31	805	14.3	76	31	804	18.8	21	31	805	17.9	59	31	804	15.1	53
2,500	31	759	17.0	50	31	758	15.8	48	31	758	17.7	37	31	758	11.4	71	31	758	16.0	21	31	758	14.5	62	31	757	12.2	54
3,000	31	715	13.6	52	31	715	12.5	46	31	715	14.1	36	31	714	8.8	64	31	714	12.7	20	31	715	11.5	62	31	713	9.3	53
4,000	31	634	5.8	59	31	633	5.2	49	31	633	5.8	39	31	632	3.4	56	31	634	5.8	19	31	634	5.2	62	31	632	2.7	55
5,000	31	561	−1.7	64	31	560	−2.7	54	31	560	−2.7	49	31	558	−2.4	49	31	560	−1.3	19	30	560	−1.9	59	31	557	−3.8	55
6,000	31	494	−8.2	64	31	492	−10.0	56	31	493	−9.9	52	31	491	−8.3	44	31	493	−8.1	19	30	494	−8.1	53	31	490	−9.8	48
7,000	30	433	−14.2	63	31	432	−16.7	51	31	432	−16.0	47	31	432	−14.9	39	31	433	−15.1	19	30	434	−14.2	44	29	430	−16.4	43
8,000	30	379	−21.4	61	30	377	−23.7	48	31	378	−23.1	45	30	377	−21.8	36	31	378	−22.4	18	30	379	−21.2	43	29	376	−24.1	41
9,000	30	330	−29.1	59	30	328	−31.4	48	31	328	−31.1	43	30	329	−29.2	35	31	329	−30.2	17	29	330	−28.5	43	29	327	−31.7	40
10,000	30	287	−36.8	57	29	285	−39.1	46	31	285	−39.0	41	30	285	−36.9	34	31	286	−38.2	17	29	287	−36.3	43	29	283	−39.1	37
11,000	30	248	−44.3		29	245	−47.0		31	246	−46.7		30	246	−44.3		31	246	−45.4		29	248	−43.8		29	244	−46.5	
12,000	29	213	−52.0		29	211	−53.7		30	211	−53.1		30	212	−51.0		31	212	−51.6		28	214	−51.1		29	210	−52.9	
13,000	29	182	−59.0		29	180	−58.9		30	180	−58.4		30	181	−56.3		31	182	−56.0		27	183	−57.6		29	179	−57.5	
14,000	29	154	−64.8		27	153	−62.4		30	153	−61.6		29	155	−60.7		31	154	−60.4		27	156	−62.7		29	153	−60.3	
15,000	29	131	−69.0		26	130	−63.0		30	130	−63.9		26	131	−64.2		30	132	−63.4		27	133	−66.0		28	130	−62.0	
16,000	29	111	−70.1		25	111	−64.6		30	111	−64.0		26	112	−65.2		30	112	−65.0		26	112	−66.6		27	111	−61.5	
17,000	28	94	−67.5		24	94	−64.1		29	94	−62.7		25	95	−65.1		29	95	−64.7		24	95	−65.8		26	94	−60.8	
18,000	25	80	−64.8		22	79	−62.4		27	80	−60.9		23	80	−64.4		27	81	−63.1		22	81	−64.0		25	80	−59.8	
19,000	18	67	−62.2		16	67	−60.7		25	68	−59.9		21	68	−62.8		23	69	−61.5		19	69	−62.2		23	68	−58.7	
20,000	9	57	−59.5		12	57	−59.0		15	58	−57.7		18	58	−60.8		20	58	−59.5		14	58	−60.5		19	58	−57.1	
21,000	5	48	−57.6		8	48	−57.3						15	49	−58.7		16	50	−57.9		6	50	−59.0		11	49	−56.1	
22,000					5	41	−56.3						9	42	−57.0		11	43	−56.7						5	42	−54.8	
23,000													6	35	−55.0		7	37	−55.2									

Stations and elevations in meters above sea level

Altitude (meters) m. s. l.	Phoenix, Ariz. (339 m.)				El Paso, Tex. (1,193 m.)				San Juan, P. R. (18 m.)				Washington,[1] D. C. (7 m.)				Atlanta, Ga. (298 m.)				Joliet, Ill. (178 m.)				Miami, Fla. (4 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	971	28.6	54	31	882	22.3	57	31	1,013	24.8	88	30	1,014	21.9	87	31	981	21.5	92	31	994	17.1	92	31	1,015	24.0	92
500	30	954	29.8	49					31	959	23.1	87	30	959	21.5	77	31	959	21.8	85	31	958	20.7	72	31	960	24.0	83
1,000	30	902	28.8	43					31	905	20.0	84	30	905	19.0	72	31	906	19.7	82	31	904	18.7	66	31	906	21.4	78
1,500	30	853	25.4	42	31	852	22.9	53	31	854	17.0	80	30	853	15.9	73	31	854	16.6	79	31	852	15.8	65	31	856	18.9	73
2,000	30	805	21.5	45	31	801	20.1	52	31	805	14.7	73	30	804	13.0	69	31	805	13.7	77	31	803	12.8	64	31	807	16.4	72
2,500	30	759	17.8	48	31	758	16.7	54	31	759	12.5	65	30	758	10.2	61	31	759	10.6	75	31	756	10.2	58	31	760	14.2	67
3,000	30	716	14.1	53	31	715	13.0	58	31	715	9.8	61	30	713	7.3	57	31	714	7.7	73	31	712	7.7	50	31	717	11.6	65
4,000	30	635	6.5	59	31	634	5.4	65	31	633	4.4	56	30	631	2.0	56	31	632	1.8	65	31	630	2.0	48	31	636	6.4	60
5,000	30	562	−1.3	66	31	561	−1.3	63	31	560	−1.4	47	30	557	−3.2	57	31	558	−3.4	61	29	556	−4.1	50	31	552	0.8	58
6,000	29	494	−7.1	67	31	494	−6.8	57	31	493	−6.9	42	30	490	−8.8	53	31	491	−9.0	57	29	489	−9.7	48	31	496	−4.9	55
7,000	29	435	−13.1	61	31	434	−12.7	51	31	433	−13.8	42	30	430	−14.7	49	31	431	−15.4	52	29	429	−16.2	45	31	436	−10.9	54
8,000	29	380	−19.5	56	31	380	−19.5	47	31	379	−20.8	42	30	376	−20.9	45	31	377	−22.4	50	28	375	−23.5	43	31	382	−17.4	54
9,000	29	332	−26.9	52	31	332	−26.8	45	31	330	−28.0	42	28	328	−28.0	42	31	328	−29.9	49	28	326	−31.1	42	30	334	−24.4	54
10,000	29	288	−34.9	50	31	288	−34.8	44	31	286	−35.6	41	27	285	−35.5	39	31	284	−37.6	48	27	283	−38.6		30	290	−31.9	52
11,000	29	249	−42.7		31	249	−42.6		31	247	−43.1		26	246	−43.3		31	245	−44.9		26	244	−45.9		30	251	−39.7	50
12,000	29	215	−50.2		30	214	−50.2		31	213	−50.2		26	212	−50.6		31	211	−51.9		26	209	−52.1		30	217	−47.3	
13,000	28	184	−57.2		30	183	−57.8		31	182	−56.9		24	181	−56.1		31	180	−58.0		23	179	−55.8		30	186	−54.6	
14,000	27	156	−64.2		30	156	−64.6		31	155	−62.7		21	154	−60.8		31	153	−63.4		22	153	−58.5		30	159	−61.1	
15,000	26	133	−68.6		31	132	−70.1		31	132	−67.5		20	131	−63.8		31	130	−66.9		21	130	−60.7		30	136	−65.9	
16,000	26	112	−70.0		29	112	−72.1		30	112	−70.2		14	111	−64.4		30	110	−68.1		18	111	−61.7		30	115	−67.9	
17,000	26	95	−69.0		29	94	−70.2		28	94	−71.6		11	94	−63.4		28	93	−66.7		17	94	−61.2		30	97	−67.9	
18,000	25	80	−66.8		26	80	−66.6		27	79	−71.4		8	80	−61.4		25	79	−64.9		14	80	−59.8		30	82	−67.2	
19,000	21	68	−63.9		21	68	−63.9		23	67	−69.6						17	67	−62.6		11	68	−57.9		28	70	−65.6	
20,000	18	58	−60.8		13	57	−61.5		17	57	−67.2						7	57	−61.3		5	58	−56.7		25	59	−64.0	
21,000	14	49	−58.9		8	49	−59.7		13	48	−64.7														22	50	−62.5	
22,000	6	42	−57.3						8	40	−62.7														12	43	−60.6	
23,000									6	34	−60.8														10	36	−59.3	
24,000																									8	31	−58.3	

Observations taken about 4 a. m. 75th meridian time.

[1] Navy.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.
Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels, also, the humidity data are not used in daily observations when the temperature is below −40° C.

TABLE 1a.—*Mean free-air barometric pressures (P) in mb., temperatures (T) in °C., and relative humidities (R. H.) in percent obtained by radiosondes during August 1939*—Continued

LATE REPORTS FOR APRIL AND MAY, 1939

Altitude (meters) m. s. l.	Boston, Mass.[1] April 1939 [2] Number of observations	Pressure	Temperature	Relative humidity	May 1939 Number of observations	Pressure	Temperature	Relative humidity
Surface	27	1,013	4.4	76	31	1,013	11.1	76
500	27	955	2.8	76	31	957	10.6	72
1,000	27	898	1.7	71	31	901	9.4	63
1,500	27	843	0.5	70	31	848	7.2	61
2,000	27	792	−1.4	67	30	798	4.2	61
2,500	27	744	−3.3	61	30	750	1.2	61
3,000	27	698	−5.4	57	30	705	−1.4	60
4,000	26	614	−10.5	52	30	621	−6.9	56
5,000	26	538	−15.7	50	30	545	−12.2	48
6,000	26	471	−22.7	49	30	478	−18.7	44
7,000	25	410	−29.8	49	29	417	−25.6	42
8,000	24	356	−37.0	49	29	362	−32.5	42
9,000	23	307	−44.0		27	314	−40.3	39
10,000	22	264	−50.5		27	270	−47.4	

Altitude (meters) m. s. l.	Boston, Mass.[1] April 1939 [2] Number of observations	Pressure	Temperature	Relative humidity	May 1939 Number of observations	Pressure	Temperature	Relative humidity
11,000	20	226	−53.5		25	232	−52.4	
12,000	18	193	−55.4		23	199	−55.5	
13,000	14	165	−56.1		22	170	−56.6	
14,000	13	141	−55.2		22	145	−56.7	
15,000	12	120	−54.7		22	124	−56.1	
16,000	11	102	−54.5		19	106	−55.7	
17,000	10	87	−53.9		18	91	−55.1	
18,000	8	75	−54.4		15	78	−53.9	
19,000	6	64	−53.7		14	66	−52.5	
20,000	5	54	−53.1		13	57	−51.1	
21,000					13	49	−49.2	
22,000					10	42	−46.6	
23,000					5	36	−44.2	

[1] Operated by Massachusetts Institute of Technology.

[2] Began April 3, 1939.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (E. S. T.) during August 1939*

[Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second (superior figures indicate number of observations)]

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.) Direction	Velocity	Albuquerque, N. Mex. (1,554 m.) Direction	Velocity	Atlanta, Ga. (302 m.) Direction	Velocity	Billings, Mont. (1,095 m.) Direction	Velocity	Boise, Idaho (850 m.) Direction	Velocity	Brooklyn, N. Y. (15 m.) Direction	Velocity
	°		°		°		°		°		°	
Surface	158	2.5^{31}	231	1.8^{31}	258	0.3^{30}	272	0.3^{31}	293	3.2^{31}	163	3.0^{30}
500					241	$.4^{30}$					192	1.7^{30}
1,000	163	3.2^{31}			190	1.0^{30}			297	3.3^{31}	236	2.0^{28}
1,500	158	2.8^{31}			91	$.6^{26}$	350	$.5^{31}$	302	2.2^{31}	266	3.1^{27}
2,000	172	2.3^{30}	225	2.1^{31}	29	1.0^{22}	311	1.2^{31}	320	1.9^{31}	275	4.6^{24}
2,500	161	1.8^{30}	224	1.0^{31}	10	1.6^{22}	284	3.4^{31}	290	2.2^{31}	268	5.8^{20}
3,000	136	1.4^{28}	357	$.3^{31}$	352	1.4^{22}	280	6.2^{30}	268	3.4^{31}	263	6.0^{17}
4,000	60	1.4^{24}	353	1.6^{31}	328	2.5^{16}	265	8.3^{25}	258	6.5^{27}	262	5.9^{16}
5,000	24	1.7^{18}	324	1.9^{29}	318	3.3^{15}	261	9.4^{21}	255	9.0^{24}	258	6.0^{13}
6,000	5	3.2^{17}	310	2.6^{28}	300	4.9^{13}	265	10.5^{20}	248	10.0^{22}	269	7.0^{10}
8,000	353	3.9^{13}	281	4.6^{22}			267	12.9^{19}	263	9.3^{16}		
10,000	320	4.2^{12}	274	11.2^{18}			261	15.7^{10}				
12,000	316	4.9^{10}	280	14.1^{13}								

Altitude (meters) m. s. l.	Brownsville, Tex. (7 m.) Direction	Velocity	Buffalo, N. Y. (220 m.) Direction	Velocity	Burlington, Vt. (132 m.) Direction	Velocity	Charleston, S. C. (18 m.) Direction	Velocity	Cheyenne, Wyo. (1,873 m.) Direction	Velocity	Chicago, Ill. (192 m.) Direction	Velocity	Cincinnati, Ohio (157 m.) Direction	Velocity
	°		°		°		°		°		°		°	
Surface	128	5.3^{30}	260	2.7^{31}	243	0.7^{31}	167	2.3^{31}	9	0.9^{31}	228	0.8^{31}	180	0.6^{31}
500	140	6.5^{30}	257	3.2^{31}	226	1.8^{31}	185	3.9^{31}			210	1.3^{31}	218	$.7^{31}$
1,000	148	5.3^{29}	249	3.9^{30}	224	3.2^{31}	206	3.2^{31}			246	3.1^{30}	239	1.5^{31}
1,500	150	3.4^{27}	241	3.4^{29}	231	4.6^{31}	228	3.4^{29}			264	2.7^{28}	261	1.7^{30}
2,000	136	2.5^{26}	243	3.8^{26}	252	6.0^{29}	232	3.4^{26}	4	$.8^{31}$	282	3.0^{28}	272	2.2^{28}
2,500	132	2.7^{22}	249	4.3^{24}	257	5.3^{24}	236	4.0^{25}	324	$.9^{31}$	296	4.2^{27}	273	3.0^{26}
3,000	136	2.3^{22}	251	4.1^{20}	263	4.8^{18}	234	3.9^{23}	298	2.1^{30}	307	4.7^{24}	292	4.3^{26}
4,000	123	1.0^{17}	261	6.5^{14}	277	6.9^{13}	234	4.2^{20}	290	5.4^{27}	293	6.3^{20}	288	4.4^{21}
5,000	132	1.6^{11}					238	5.6^{11}	286	8.4^{25}	274	9.1^{19}	271	4.6^{17}
6,000	126	1.8^{10}							296	11.9^{18}			270	7.1^{13}
8,000									288	16.8^{13}				
10,000									289	21.1^{11}				
12,000														

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.) Direction	Velocity	Fargo, N. Dak. (283 m.) Direction	Velocity	Greensboro, N. Car. (271 m.) Direction	Velocity	Havre, Mont. (766 m.) Direction	Velocity	Houston, Tex. (21 m.) Direction	Velocity	Huron, S. Dak. (393 m.) Direction	Velocity
	°		°		°		°		°		°	
Surface	194	1.8^{31}	223	1.1^{31}	239	0.8^{28}	263	1.3^{30}	186	2.2^{31}	211	1.6^{31}
500			220	1.8^{31}	211	1.0^{29}	253	2.4^{30}	184	3.3^{31}	215	1.7^{31}
1,000			250	2.0^{30}	244	1.6^{28}	258	3.5^{30}	198	2.7^{31}	213	1.5^{31}
1,500	177	1.6^{31}	253	3.2^{29}	268	2.5^{27}	266	4.1^{29}	188	1.9^{30}	219	1.9^{31}
2,000	122	1.6^{31}	268	4.5^{29}	278	3.4^{27}	259	4.8^{28}	148	1.3^{28}	260	2.6^{28}
2,500	96	2.5^{31}	281	4.9^{28}	273	3.7^{23}	265	6.1^{26}	122	1.1^{23}	285	4.1^{27}
3,000	77	2.7^{30}	292	5.5^{26}	258	3.3^{18}	272	9.4^{22}	126	1.1^{26}	298	5.8^{27}
4,000	70	2.5^{24}	303	8.4^{21}	265	3.3^{12}	273	11.0^{18}	329	$.2^{21}$	302	7.4^{25}
5,000	89	1.8^{19}	295	11.3^{17}	240	3.4^{10}	280	13.0^{10}	299	2.0^{16}	304	8.7^{23}
6,000	182	$.7^{14}$	296	12.4^{16}					292	2.5^{18}	310	9.9^{20}
8,000	218	$.3^{13}$	289	14.4^{14}							304	11.7^{17}
10,000			300	16.9^{10}							300	12.9^{13}
12,000											299	16.2^{11}
14,000												
16,000												

Altitude (meters) m. s. l.	Las Vegas, Nev. (570 m.) Direction	Velocity	Little Rock, Ark. (82 m.) Direction	Velocity	Medford, Oreg. (410 m.) Direction	Velocity	Miami, Fla. (10 m.) Direction	Velocity	Minneapolis, Minn. (261 m.) Direction	Velocity	Nashville, Tenn. (194 m.) Direction	Velocity	New Orleans, La. (19 m.) Direction	Velocity
	°		°		°		°		°		°		°	
Surface	185	1.7^{31}	204	1.1^{31}	315	2.0^{31}	109	1.8^{30}	253	1.8^{30}	338	0.1^{30}	237	1.7^{31}
500			241	1.0^{31}	312	2.3^{31}	134	1.8^{30}	251	2.2^{30}	276	0.4^{30}	262	2.9^{31}
1,000	183	1.8^{31}	270	1.7^{31}	314	2.4^{31}	162	1.3^{29}	239	2.3^{29}	247	0.9^{30}	280	3.2^{30}
1,500	183	2.0^{31}	280	2.2^{30}	274	1.2^{31}	202	1.2^{29}	251	2.3^{28}	264	1.7^{29}	308	3.1^{30}
2,000	219	2.6^{31}	299	3.2^{31}	215	2.1^{31}	180	1.3^{27}	276	3.0^{26}	276	2.7^{29}	320	2.9^{29}
2,500	236	3.2^{31}	309	3.7^{30}	205	3.5^{31}	180	1.3^{27}	300	5.1^{22}	286	2.3^{29}	326	2.6^{29}
3,000	229	3.5^{30}	304	4.5^{30}	212	5.0^{31}	179	1.8^{27}	299	6.8^{21}	292	2.4^{28}	331	2.9^{29}
4,000	216	3.6^{30}	329	5.4^{28}	221	6.7^{31}	169	2.3^{27}	305	7.6^{17}	298	2.9^{17}	340	3.1^{25}
5,000	202	3.7^{28}	334	6.4^{22}	221	7.6^{31}	183	2.3^{26}	307	7.1^{14}	289	4.7^{11}	318	2.7^{21}
6,000	201	4.3^{26}	337	5.6^{14}	228	8.0^{30}	152	2.5^{22}	306	8.7^{12}			295	3.1^{18}
8,000	262	4.8^{25}	302	5.0^{10}	237	11.1^{19}	94	4.5^{15}						
10,000	263	9.0^{23}												
12,000	262	13.4^{22}												
14,000	270	13.1^{19}												
16,000	254	6.0^{16}												

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.) Direction	Velocity	Oklahoma City, Okla. (402 m.) Direction	Velocity	Omaha, Nebr. (306 m.) Direction	Velocity	Reno, Nev. (1,346 m.) Direction	Velocity	St. Louis, Mo. (170 m.) Direction	Velocity	Salt Lake City, Utah (1,294 m.) Direction	Velocity
	°		°		°		°		°		°	
Surface	276	4.7^{31}	188	2.3^{31}	172	1.0^{31}	266	0.7^{31}	202	0.6^{31}	305	1.7^{31}
500	273	2.9^{31}	187	2.7^{31}	164	$.7^{31}$			120	$.8^{31}$		
1,000	223	2.4^{30}	194	3.0^{31}	196	$.8^{31}$			245	$.5^{31}$		
1,500	201	3.1^{30}	209	3.6^{31}	233	1.3^{31}	251	$.7^{31}$	248	1.2^{30}	309	1.8^{31}
2,000	185	4.0^{29}	224	3.0^{30}	269	2.4^{31}	206	1.5^{31}	264	3.0^{27}	310	1.9^{31}
2,500	194	4.7^{29}	258	3.0^{28}	287	3.6^{29}	199	3.0^{31}	278	3.8^{24}	307	2.2^{31}
3,000	198	5.4^{29}	282	3.1^{26}	283	6.6^{27}	215	3.8^{31}	272	5.4^{15}	275	2.9^{31}
4,000	198	7.0^{28}	300	3.6^{23}	289	10.0^{24}	220	6.9^{30}			273	4.9^{30}
5,000	207	6.7^{27}	332	4.5^{22}	294	10.2^{22}	216	7.8^{29}			278	6.4^{26}
6,000	221	5.8^{24}	321	6.1^{21}	295	11.5^{18}	227	7.4^{27}			277	7.0^{19}
8,000	233	8.3^{19}	315	6.9^{17}	299	12.9^{14}	239	12.2^{25}			286	6.9^{11}
10,000			308	6.6^{14}	293	16.1^{12}	248	17.7^{21}				
12,000			302	11.8^{13}	292	16.4^{10}	263	17.0^{10}				
14,000												

Altitude (meters) m. s. l.	San Diego, Calif. (15 m.) Direction	Velocity	San Juan, P. R. (16 m.) Direction	Velocity	Sault Ste. Marie, Mich. (198 m.) Direction	Velocity	Seattle, Wash. (14 m.) Direction	Velocity	Spokane, Wash. (603 m.) Direction	Velocity	Washington, D. C. (10 m.) Direction	Velocity	Winslow, Ariz. (1,488 m.) Direction	Velocity
	°		°		°		°		°		°		°	
Surface	226	4.3^{30}	83	5.3^{31}	267	2.1^{30}	285	2.4^{31}	237	1.4^{31}	205	1.2^{31}	318	1.1^{31}
500	294	2.3^{30}	99	6.8^{31}	271	2.4^{30}	293	1.0^{31}			215	1.5^{31}		
1,000	292	1.3^{30}	108	5.9^{30}	253	3.5^{28}	221	1.2^{29}	234	2.4^{31}	238	1.3^{30}		
1,500	315	1.3^{27}	105	5.7^{29}	256	3.9^{25}	197	2.4^{28}	223	2.5^{31}	296	1.9^{30}		
2,000	287	$.5^{27}$	99	5.5^{28}	265	5.7^{23}	216	1.6^{24}	225	3.7^{31}	309	3.0^{28}	306	$.9^{31}$
2,500	167	$.8^{28}$	96	5.3^{27}	276	7.2^{21}	251	1.3^{21}	228	4.4^{28}	289	4.1^{27}	294	1.5^{31}
3,000	158	1.8^{25}	92	5.1^{26}	282	7.2^{19}	255	2.4^{20}	242	4.9^{27}	273	5.0^{24}	294	1.2^{31}
4,000	135	2.4^{24}	77	5.6^{23}	278	9.4^{17}	268	2.7^{19}	259	7.1^{24}	266	5.6^{17}	244	$.2^{29}$
5,000	156	3.6^{20}	81	4.0^{20}	290	10.5^{15}	269	4.5^{18}	250	9.5^{20}			242	$.7^{27}$
6,000	174	2.0^{17}	100	3.7^{17}	286	12.5^{16}	285	5.2^{15}	240	11.7^{18}			161	$.3^{24}$
8,000			188	1.5^{13}			296	5.1^{12}					288	1.5^{19}
10,000													269	5.7^{19}
12,000													273	10.9^{18}
14,000													276	10.0^{17}

TABLE 3.—*Maximum free-air wind velocities (M. P. S.), for different sections of the United States based on pilot balloon observations during August 1939*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	29.2	WSW	1,210	9	Buffalo, N. Y.	28.8	W	4,320	9	Albany, N. Y.	42.2	WSW	11,380	29	Syracuse, N. Y.
East-Central [2]	26.0	W	1,070	18	Greensboro, N. C.	22.8	WNW	3,490	7	Cincinnati, Ohio	25.0	SW	11,310	5	Elkins, W. Va.
Southeast [3]	25.7	SSW	2,410	12	Tampa Fla.	36.8	ESE	4,970	13	Birmingham, Ala.	36.6	ESE	5,010	13	Birmingham, Ala.
North-Central [4]	31.0	SSW	1,330	21	Detroit, Mich.	36.6	WSW	4,920	27	Bismarck, N. Dak.	58.0	W	13,740	21	Huron, S. Dak.
Central [5]	40.4	SSW	1,420	10	Wichita, Kans.	30.6	NW	3,990	22	Des Moines, Iowa	41.6	WNW	12,240	6	Omaha, Nebr.
South-Central [6]	24.2	WSW	610	19	Jackson, Miss.	31.2	W	3,190	10	Amarillo, Tex.	33.0	WNW	12,890	21	Oklahoma City, Okla.
Northwest [7]	24.9	W	1,260	11	Pendleton, Oreg.	28.6	SSW	5,000	27	Medford, Oreg.	52.0	SSW	8,140	27	Medford, Oreg.
West-Central [8]	23.6	WSW	1,880	9	Pueblo, Colo.	40.7	SSE	3,980	29	Ely, Nev.	52.4	SSW	9,070	27	Redding, Calif.
Southwest [9]	30.8	NNW	2,250	15	Sandberg, Calif.	24.2	NNW	2,510	15	Sandberg, Calif.	39.0	W	13,620	7	Las Vegas, Nev.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during April 1939, classified according to the potential temperatures (10-degree intervals between 320° and 409° A.) with which they are identified. (Based on radiosonde observations)*

Potential temperatures, ° A.	Albuquerque, N. Mex.			Bismarck, N. Dak.			Charleston, S. C.			Denver, Colo.			El Paso, Tex.			Ely, Nev.			Miami, Fla.		
	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, ° C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, ° C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, ° C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, ° C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, ° C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, ° C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, ° C.
310-319				2	8.5	−40.5															
320-329				10	9.6	−44.5				1	10.0	−49.0				2	9.2	−38.0			
330-339	2	11.8	−56.5	20	11.0	−51.4	2	10.0	−39.0	11	11.3	−52.0	1	9.8	−38.0	13	10.7	−47.0			
340-349	9	12.6	−58.0	21	12.1	−54.7	17	12.1	−53.5	12	12.0	−53.4	13	12.2	−54.2	15	12.2	−55.9	4	12.4	−54.7
350-359	17	14.1	−66.5	10	13.2	−59.2	19	13.3	−58.2	11	13.8	−63.2	23	14.1	−66.5	12	13.5	−61.5	7	14.1	−58.9
360-369	9	15.0	−69.8	5	14.0	−61.4	13	14.8	−66.1	5	14.4	−62.8	17	15.1	−71.5	7	14.4	−65.3	13	14.8	−66.9
370-379	10	15.8	−71.4	1	14.4	−59.0	9	15.8	−71.2	6	14.8	−64.8	14	15.9	−72.7	8	15.0	−65.8	13	15.5	−68.4
380-389	10	16.0	−69.3	4	15.1	−62.0	3	16.3	−72.3	5	16.2	−67.8	6	16.4	−73.7	10	15.6	−65.7	5	16.2	−67.6
390-399	2	16.7	−69.5	1	16.0	−65.0	5	16.5	−67.0	6	16.4	−67.2	4	16.9	−72.8	6	16.1	−64.8	8	16.7	−68.8
400-409	1	17.1	−70.0	1	16.2	−62.0	1	17.5	−73.0	8	16.6	−64.4	1	17.2	−71.0	1	16.6	−67.0	3	17.0	−69.7
All (weighted means)		14.7	−66.8		11.9	−53.8		13.9	−61.1		13.9	−60.3		14.6	−67.2		13.4	−58.9		15.3	−65.8
Mean potential temperature (weighted), ° A.		365.0			344.7			360.8			359.4			362.8			358.8			372.5	

Potential temperatures °A.	Nashville, Tenn.			Oakland, Calif.			Oklahoma City, Okla.			Omaha, Nebr.			Phoenix, Ariz.			San Antonio, Tex.			Washington, D. C.		
	Number of cases	Mean altitude (km) m. s. l.	Mean temperature °C	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature, °C.
320-329	3	10.3	−50.0	2	10.0	−44.5				2	8.6	−34.0									
330-339	10	11.0	−49.9	10	10.6	−45.5	2	10.8	−46.0	7	10.5	−46.1	3	11.8	−55.7	2	10.4	−41.5	1	11.9	−57.0
340-349	19	12.2	−53.3	17	11.8	−49.8	8	12.2	−54.9	19	12.3	−55.6	5	12.2	−52.6	5	11.9	−50.4	16	11.8	−51.4
350-359	13	12.9	−55.6	8	13.4	−60.2	13	13.7	−62.2	8	13.3	−59.8	13	13.8	−63.3	10	13.9	−65.5	12	13.2	−57.5
360-369	12	14.6	−65.3	10	14.2	−60.7	12	14.5	−65.7	6	14.3	−63.5	15	15.1	−69.7	7	14.7	−67.9	8	14.6	−64.6
370-379	9	15.4	−67.8	8	15.1	−64.4	5	15.2	−67.2	8	14.9	−63.2	8	16.0	−71.0	4	16.1	−74.0	1	14.7	−59.0
380-389	4	15.4	−62.5	7	15.7	−67.0	7	15.8	−67.1	5	15.5	−63.2	4	16.4	−70.2	13	16.4	−71.6	2	14.7	−65.0
390-399	6	16.5	−66.7	10	16.2	−66.3	3	16.3	−65.7	5	15.6	−60.8	4	16.7	−70.5	2	17.2	−74.0	2	16.6	−68.5
400-409	3	16.7	−66.0	5	16.6	−65.8	5	17.0	−67.2	5	16.5	−63.8				3	17.3	−70.3			
All (weighted means)		13.5	−58.6		13.7	−57.9		14.4	−63.0		13.4	−57.7		14.6	−65.9		14.9	−66.3		13.2	−57.4
Mean potential temperature (weighted), °A.		358.5			363.3			366.1			361.4			364.5			369.1			356.3	