westward the disturbance decreased rapidly in intensity as it approached the Mexican coast, and moved inland, for the third time, as a weak depression near Vera Cruz on September 30.

Complete information regarding loss of life and property damage for this storm is not available at this time, but since it was of hurricane intensity, damage in the Central American countries affected was probably severe.

The tracks of these tropical disturbances of September 1941 are shown on the accompanying chart.

NOTES AND REVIEWS

W. E. KNOWLES MIDDLETON. **Visibility in Meteorology.** 2nd Edition. Toronto (University of Toronto Press), 1941. 165 pp., 32 figs.

The second edition of this monograph is a comprehensive summary on the theory and practice of the measurement of the visual range. It is still the only book devoted wholly to this subject which, in some respects, has been neglected in this era of expanded transport.

The concisely and carefully written theoretical portions of the first edition have been largely retained in this new issue, with some small improvements in notation, and several important brief additions. Among the topics discussed in the new material are the following: Variation of the extinction coefficient with visual range and with size of water droplets, for different colors; nature of atmospheric aerosols; properties of the eye in the light- and dark-adapted states; and visual range in fog, and its relation to water content.

The "practical" part of the first edition has been superseded by a largely rewritten version. In connection with this, a variety of telephotometers and transmission meters for measuring the atmospheric extinction coefficient are described. Great expansion in scope of the chapter relating to the estimation of the visual range in practice has enabled the author to present a comparative discussion on various visibility scales, a matter of considerable interest to those concerned with the technique of making observations for airway and synoptic reports.

A new chapter on "Forecasting the visual range," and a new appendix on "The visual range of coloured objects" contain material of great practical and theoretical importance.

Revision of the book has increased its size by 61 pages, and the number of figures by 23. The extensive bibliography on visibility and pertinent additional topics given in the work now covers 342 items.—L. P. H.

SVERRE PETTERSSEN. **Introduction to Meteorology.** New York (McGraw-Hill Book Co.), 1941. ix, 236 pp., 142 figs.

This book is intended as an elementary introduction to general meteorology, for students without previous knowledge of the subject. No mathematics beyond an occasional simple algebraic formula is used; and the elementary physics involved is explained in the text. The emphasis is on synoptic and aeronautical meteorology; but nearly all the more important topics of meteorology proper (i. e., exclusive of optical, electrical, and acoustic phenomena of the atmosphere) are at least briefly discussed.

The opening chapters describe the general nature and structure of the atmosphere, and the principal types of meteorological observations and instruments. A chapter is then devoted to evaporation, condensation, and precipitation, followed by two chapters on adiabatic processes in the atmosphere and atmospheric stability. The next chapter discusses the processes by which transfers of heat and changes of temperature are brought about in the atmosphere, and some of their effects—including modification of lapse rates, occurrence of convection, thunderstorms, fog formation, and ice accretion on airplanes.

A chapter on atmospheric circulation—winds, their relation to pressure distribution and their variation with height; the planetary circulation; turbulence; etc.—is followed by two chapters on air masses and fronts, and a chapter on cyclones (extratropical and tropical) and anticyclones, with a brief allusion to tornadoes and waterspouts. The next three chapters are devoted to the drawing and analysis of synoptic maps, and the forecasting of weather, in accordance with the most recent methods, illustrated by a number of actual examples.

The book concludes with a chapter on climate and the climates of the earth, and one on the history of meteorology. A list of recommended books for further reading, a few short tables, and an index are appended.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR SEPTEMBER 1941

[Climate and Crop Weather Division, J. B. KINCER in charge]

AEROLOGICAL OBSERVATIONS

By HOMER D. DYCK

Surface temperatures for September were above normal generally over the eastern half of the country and below normal over the western half with the exception of a strip along the Pacific coast which recorded above normal warmth. Plus departures of from 4° to 6° F. were recorded in the southern Lake region, the Ohio Valley and Tennessee and the Middle Atlantic States, while minus departures of from 4° to 6° F. were recorded in the Great Basin.

At 1,500 meters above sea level the 5 a. m. resultant winds for September were from directions to the south of normal over most of the country east of the Rocky Mountains and north of normal at this level over the rest of the country. At 3,000 meters the morning resultant winds were more northerly than normal along the Middle and North Atlantic coast and west of the Rocky Mountains and more southerly than normal elsewhere. At the 5,000 meter level, a comparison of the 5 p. m. resultant winds for September with the 5 a. m. normals shows that the late afternoon resultants were more southerly than the corresponding morning normals at about half of the stations for which these data could be compared.

It is interesting to note that the above-normal temperatures in the eastern half of the country were accompanied by more southerly than normal wind resultants generally and the below normal temperatures in the West coincided with more northerly than normal resultants. Exceptions to this correspondence are the strips along each coast.

Resultant wind velocities at 1,500 meters were above normal over most of the country with the exception of the southern Plateau region and the Middle Atlantic States, where they were slightly below normal. At 3,000 meters resultant velocities were above normal except over the Middle and South Atlantic States, while at 5,000 meters the 5 p. m. resultant velocities were higher than the corresponding 5 a. m. normals over the same regions.

At 1,500 meters the 5 p. m. resultant winds for the

month were from more southerly directions than were the corresponding 5 a. m. winds generally with the exception of a few scattered stations in the Gulf States. At 3,000 meters a turning to southward during the day was noted over the northern half of the country with the exception of the Northeast and the Northwest, where, as in the southern half of the country, the opposite shift was noted during the day.

The 5 p. m. resultant velocities at 1,500 meters were lower than the corresponding 5 a. m. velocities over the eastern half of the United States with the exception of areas along the Middle and South Atlantic coasts while they were higher over the western half with the exception of California. At 3,000 meters the afternoon velocities were higher generally than the corresponding morning velocities except in Florida and parts of the Great Plateau, where they were lower.

The upper-air data discussed above are based on 5 a. m. (E. S. T.) pilot balloon observations (charts VIII and IX) as well as on observations made at 5 p. m. (table 2 and charts X and XI).

Radiosonde and airplane stations located in the southern part of the country recorded on the average the highest daily pressures at each of the standard levels from 2,000 meters to 18,000 meters. The highest mean monthly pressure at the 2,000 meter level occurred over Atlanta, Charleston, Nashville, Norfolk, and Washington, D. C.; over Atlanta and Charleston at 2,500 meters and over Atlanta from 3,000 to 6,000 meters, inclusive. A similar maximum was also recorded over San Antonio and Nashville at 6,000 meters. At each level from 7,000 to 18,000 meters, inclusive, San Antonio recorded the maximum pressure. At 17,000 meters, however, two other stations, Nashville and Washington, also recorded the maximum and at 18,000 meters, Nashville, Phoenix, San Diego, and Washington also recorded the maximum. Great Falls recorded the minimum pressure at 2,000 meters, Spokane and Great Falls the minimum at 2,500 meters, and Spokane the minimum at 3,000 meters. At 4,000 meters Great Falls, Seattle, and Spokane recorded the minimum while from 5,000 to 7,000 meters, Seattle and Spokane recorded the minimum. At all standard levels from 8,000 to 18,000 meters, inclusive, the minimum pressure occurred over Spokane.

With but few exceptions, mean pressures for September were lower than those for August over most stations west of the Mississippi River and over Florida at most levels up to and including 19,000 meters. The decrease in mean pressure was quite marked over the northern Plateau region, amounting to as much as 12 millibars over Great Falls at 7,000 meters. In the lower levels up to and including 3,000 meters, the area over which pressures averaged above August's included the eastern Lake Region, Ohio Valley and Tennessee, and the Atlantic States, excluding Florida. At higher levels from 5,000 to 13,000 meters, the area of higher pressures decreased to include only the eastern Lake region, and the Middle and North Atlantic States. Above 13,000 meters pressures averaged near August's over most of the country east of the Mississippi River. Pressure gradients this month were not as steep along the Atlantic coast but were steeper in the Northwest than during the preceding month. The steepest upper level pressure gradient for September occurred at the 8,000, 11,000 and 12,000 meter levels between Sault Ste. Marie and Detroit. At these levels there was a change of 1 millibar pressure for each 38 miles of horizontal distance between these two cities.

Mean free-air temperatures for September were generally lower than those for August for most stations in the United States up to and including 11,000 meters. Notable exceptions to this generalization, however, were temperatures higher than August's over the eastern Lake region, the North and Middle Atlantic States, the Florida Peninsula, and southern Texas from about 2,000 meters to about 11,000 meters. Above 11,000 meters, temperatures were above August's over the Plateau and generally lower over the remainder of the country. The decreases from last month's temperatures were most pronounced over the northern Plateau region where decreases of 8° to 9° C. were recorded in the lower levels. At three stations, Medford, Oreg., St. Louis, Mo., and Huntington, W. Va., free-air temperatures were lower than last month at all levels.

When temperatures for September 1941 are compared with temperatures for September 1940, it may be seen that from levels up to and including 11,000 meters, the temperatures this month averaged lower than those of a year ago over much of the Plateau region and the far Northwest and higher than those of a year ago over the remainder of the country. Above 13,000 meters these conditions were almost reversed.

Mean temperatures for September at both the 1,000 and 3,000 meter levels were above normal over the eastern half of the country and below normal elsewhere. At 5,000 meters the area of above-normal temperatures increased in extent to include the southern Plateau region and most of the Great Plains area with below-normal temperatures over the remainder. Plus departures were most pronounced over the Middle West and minus departures most pronounced in the far Northwest.

Relative humidities at 1,000 meters averaged above normal over the far Northwest, the Great Plains and the Lake region, and slightly below normal elsewhere. At 3,000 meters humidities were decidedly above normal over the far Northwest, and somewhat above normal over the Rocky Mountain region and the Great Plains, with somewhat below normal humidities elsewhere. At 5,000 meters the northern third of the country and the extreme southern part recorded above normal humidities while the remainder recorded below-normal humidities.

The altitude at which the mean monthly temperature of 0° C. for September occurred, varied from the lowest (2,500 meters) over Seattle, Wash., to the highest (5,200 meters) over San Antonio, Tex. The level at which, on the average, freezing conditions occurred was lower than last month generally except over Texas, Florida, the Lake Region, and the Northeast where it was slightly higher. This level was decidedly lower than last month over the far Northwest and the northern Plateau region, being 1,300 meters lower over Great Falls, Mont.

The lowest free-air temperature recorded during the month over the United States was −85.8° C. (−122° F.). This temperature occurred over San Antonio on the morning of September 3, at an altitude of 16,800 meters (about 10.4 miles) above sea level. The lowest temperature for the month over San Juan was −83.0° C. (−117° F.) which was observed at 16,800 meters (about 10.4 miles) above sea level on the afternoon of September 25.

Table 3 shows the maxima free-air wind velocities and their directions for various sections of the United States during September as determined by pilot balloon observations. The highest observed wind velocity for the month was 70.4 m. p. s. (157 miles per hour) observed over Reno, Nev., on September 11. This wind was blowing from the west-southwest at an elevation of 10,910 meters (about 6.8 miles) above sea level.

The highest September wind velocity observed during the last 5 years in the free-air layer from the surface to

2,500 meters was 48.6 m. p. s. (109 miles per hour) observed on September 19, 1941, over Modena, Utah (see table 3). The wind velocity of 55.0 m. p. s. (123 miles per hour) over Ely, Nev., on September 18, this year (see table 3) was the highest observed in the layer from 2,500 meters to 5,000 meters, while during this 5-year period, a still higher wind velocity, 78.0 m. p. s. (174 miles per hour) was observed in September in the free air above the 5,000 meter level. This wind was observed on September 12, 1940 over San Antonio, Tex., and was blowing from the west-northwest at an elevation of 21,230 meters (about 13.2 miles).

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during September 1941*

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho (894 m.)				Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Charleston, S. C. (14 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	837	19.0	48	31	985	22.0	77	31	953	12.2	79	29	914	13.2	52	31	1,012	26.3	87	30	992	16.0	76	31	1,017	22.1	90
500					31	963	22.7	66									31	957	24.8	86	30	961	17.1	66	31	962	22.1	77
1,000					31	909	20.0	68	31	898	13.4	65	29	900	15.7	50	31	904	22.2	80	30	906	14.8	64	31	908	19.4	72
1,500					31	858	16.8	72	31	846	11.0	64	29	848	13.9	47	31	853	19.2	76	30	854	12.3	61	31	857	16.6	66
2,000	31	801	18.1	46	31	808	14.6	66	31	797	8.5	61	29	799	10.2	49	31	804	16.4	70	30	804	10.5	53	31	808	14.3	60
2,500	31	755	14.8	48	31	762	12.0	61	31	750	6.0	58	29	752	6.5	52	31	758	13.9	63	30	757	8.5	46	31	762	12.1	48
3,000	31	712	11.4	53	31	718	9.6	54	31	705	3.2	58	29	707	2.9	56	31	715	11.4	59	30	712	6.4	38	31	717	9.5	43
4,000	30	631	4.1	62	30	636	4.4	45	30	623	−3.0	60	29	624	−3.8	59	31	634	6.2	55	29	630	1.8	32	31	635	4.2	37
5,000	28	557	−2.1	63	30	562	−1.0	38	30	548	−9.2	58	29	550	−10.0	55	31	561	0.5	51	29	556	−3.5	30	31	561	−1.3	34
6,000	29	490	−8.1	52	30	495	−7.0	35	29	481	−15.8	56	29	482	−16.7	52	31	494	−5.2	45	28	489	−9.4	27	31	494	−7.3	32
7,000	29	431	−14.3	40	30	435	−13.7	34	29	421	−22.6	56	29	421	−23.3	50	31	435	−11.6	42	26	429	−16.3	24	31	434	−13.9	31
8,000	29	377	−21.4	38	30	380	−20.8	32	29	366	−29.3	54	25	367	−30.4	48	31	381	−18.3	40	26	375	−23.3	23	31	380	−21.0	31
9,000	29	328	−28.4	36	30	331	−27.9	33	29	317	−36.4	51	24	318	−37.5	47	31	332	−25.6	38	26	326	−30.3	24	31	331	−28.5	31
10,000	29	285	−35.3	35	28	288	−35.1	31	29	274	−43.3		23	274	−44.2		30	289	−32.9	36	26	283	−37.1	23	31	288	−36.2	31
11,000	28	247	−42.4		28	249	−42.4		29	236	−48.5		22	236	−49.3		30	250	−40.8		26	244	−44.4		31	248	−43.8	
12,000	28	212	−49.1		28	214	−49.3		28	202	−51.8		20	203	−51.6		29	215	−48.7		23	209	−51.1		31	213	−51.1	
13,000	25	182	−55.6		27	184	−55.9		28	173	−53.9		20	173	−52.4		29	185	−56.5		22	179	−56.9		29	183	−57.8	
14,000	25	155	−61.1		26	157	−61.9		28	148	−55.5		19	148	−53.6		29	157	−64.2		21	152	−61.7		29	156	−64.2	
15,000	23	132	−65.3		26	133	−66.9		29	126	−57.0		19	127	−55.2		29	134	−70.9		20	130	−64.9		28	132	−68.8	
16,000	22	112	−67.6		26	113	−70.0		28	108	−57.4		19	109	−56.0		26	113	−75.0		19	110	−65.7		28	112	−70.9	
17,000	19	94	−67.0		24	95	−70.4		26	92	−56.6		16	93	−55.7		23	95	−75.0		17	93	−64.2		25	94	−70.5	
18,000	15	80	−64.6		23	80	−67.6		24	78	−55.7		12	79	−54.7		12	80	−71.8		15	78	−62.0		20	80	−66.9	
19,000	8	68	−61.6		12	68	−64.3		15	67	−54.6						6	68	−67.4		10	66	−59.2		11	68	−63.1	
20,000	5	58	−58.9						6	57	−53.4										6	56	−57.0					

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Denver, Col. (1,616 m.)				Detroit, Mich. (194 m.)				El Paso, Tex. (1,193 m.)				Ely, Nev. (1,908 m.)				Great Falls, Mont. (1,128 m.)				Huntington, W. Va. (172 m.)				Joliet, Ill. (178 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	837	13.6	62	31	994	15.7	82	30	881	21.4	66	31	808	9.3	40	30	885	9.9	67	31	999	17.7	86	29	996	17.5	80
500					31	960	18.0	70													31	962	20.6	64	29	959	19.0	64
1,000					31	905	16.0	66													30	908	18.4	62	29	905	16.7	65
1,500					31	853	14.2	63	30	850	20.9	63					30	846	9.4	62	30	856	15.8	62	29	853	14.1	67
2,000	31	800	15.4	52	31	804	12.7	53	30	802	17.9	63	31	799	11.8	39	30	796	6.1	63	30	807	13.9	52	29	804	12.0	64
2,500	31	753	12.3	50	31	757	10.5	44	30	756	14.5	64	31	752	10.3	39	30	749	2.7	65	30	760	11.5	48	29	757	9.8	58
3,000	31	709	8.9	51	31	713	7.8	39	30	713	10.9	65	31	708	6.5	40	30	704	−.5	66	30	716	8.8	46	29	712	7.3	53
4,000	29	628	2.1	52	31	631	2.7	33	30	632	4.6	66	31	626	−.9	40	30	620	−6.8	64	29	634	3.8	40	28	630	2.1	45
5,000	29	554	−5.1	52	31	557	−2.9	28	30	558	−.9	59	31	552	−7.1	37	30	545	−12.7	61	29	560	−1.1	31	28	556	−3.3	41
6,000	29	488	−11.3	44	31	490	−8.7	24	30	492	−6.9	55	31	484	−13.8	36	30	477	−19.5	56	29	493	−7.6	26	28	490	−9.0	36
7,000	29	428	−18.0	40	30	430	−15.1	21	28	432	−13.5	50	31	425	−20.9	35	30	416	−26.3	53	29	433	−14.4	25	28	430	−15.5	34
8,000	29	373	−25.4	37	30	376	−22.1	22	28	378	−20.5	47	31	370	−28.4	34	30	362	−33.6	54	29	379	−21.2	24	28	376	−22.2	34
9,000	28	324	−33.1	35	29	327	−29.1	22	28	329	−27.5	47	31	320	−35.6	34	30	313	−41.3		28	330	−28.3	23	28	327	−29.4	33
10,000	25	281	−40.1		28	284	−35.9	23	27	286	−34.5	48	31	277	−42.8		30	270	−47.6		28	286	−35.4	20	26	284	−36.4	31
11,000	20	242	−46.5		28	246	−42.9		27	247	−42.2		29	239	−48.4		30	232	−52.2		27	248	−42.8		26	245	−43.4	
12,000	19	208	−51.7		27	212	−49.6		27	213	−49.5		29	205	−53.1		30	198	−52.8		25	212	−50.0		21	211	−49.9	
13,000	17	178	−56.3		26	181	−55.6		26	182	−56.6		29	175	−55.9		30	170	−52.6		23	182	−56.6		21	181	−56.0	
14,000	16	152	−60.6		25	155	−60.2		25	155	−63.6		29	150	−58.0		29	145	−53.1		23	155	−62.5		19	154	−61.3	
15,000	16	129	−63.3		23	131	−63.8		24	131	−66.5		26	127	−59.6		29	124	−53.8		23	132	−66.6		19	131	−65.0	
16,000	15	110	−64.3		22	112	−65.2		23	111	−68.9		24	109	−60.3		26	107	−54.4		22	112	−67.5		16	111	−66.3	
17,000	14	93	−63.2		21	95	−64.2		21	94	−65.9		19	93	−59.3		20	91	−53.8		21	95	−66.0		14	94	−65.4	
18,000	8	79	−59.7		19	80	−61.3		18	79	−61.6		12	79	−57.4		14	78	−53.7		18	80	−63.7		10	80	−63.0	
19,000					14	69	−59.0		14	68	−58.2										12	68	−61.1		5	67	−60.0	
20,000					8	58	−56.6		8	58	−55.4																	

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during September 1941*—Continued

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Lake Charles, La. (5 m.)				Lakehurst, N. J.[1] (39 m.)				Medford Oreg. (401 m.)				Miami, Fla. (4 m.)				Nashville, Tenn. (180 m.)				Norfolk, Va.[1 2] (10 m.)				Oakland, Calif. (2 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	29	1014	23.9	92	29	1015	14.6	84	31	968	15.0	66	31	1015	24.8	91	31	997	22.2	71	25	1020	21.5	80	31	1012	16.6	75
500	29	959	24.0	79	29	961	16.4	75	31	956	15.7	63	31	960	23.4	93	31	961	23.9	62	25	964	21.4	68	31	955	16.9	60
1,000	28	906	21.4	78	29	907	14.7	66	31	902	13.2	63	31	906	20.4	86	31	908	21.2	64	25	909	18.5	68	31	900	16.7	44
1,500	28	854	18.5	77	29	855	13.4	54	31	850	10.0	68	31	855	17.8	78	31	857	17.9	68	25	858	16.2	66	31	850	14.7	37
2,000	28	806	15.6	69	29	805	11.3	49	31	799	7.0	70	31	806	15.0	73	31	808	14.7	66	25	808	13.8	62	31	800	11.9	32
2,500	28	760	13.3	60	29	758	9.5	43	31	752	4.6	61	31	760	12.3	68	31	761	12.0	58	25	761	11.9	50	31	753	9.1	27
3,000	28	716	10.6	57	29	714	7.3	35	31	707	2.3	53	31	716	9.7	64	31	717	9.6	50	25	717	9.3	44	31	709	6.5	24
4,000	27	634	5.2	50	29	631	2.3	25	31	624	−2.9	46	31	634	4.5	61	31	635	4.8	39	25	635	3.1	39	31	627	1.0	21
5,000	27	561	−0.2	46	29	557	−2.7	23	31	550	−8.8	42	31	561	−1.0	57	31	561	−0.3	32	23	560	−3.0	29	31	553	−5.0	20
6,000	26	494	−6.0	45	29	490	−8.4	22	31	482	−15.2	40	31	494	−6.8	56	30	495	−6.5	31					31	486	−11.4	18
7,000	24	434	−12.5	41	28	430	−15.0	26	31	422	−21.9	40	31	434	−13.2	54	30	435	−13.0	30					30	426	−18.4	17
8,000	23	380	−19.7	38	27	376	−21.8	31	30	368	−29.5	40	31	380	−19.8	53	29	380	−20.0	26					30	372	−25.8	17
9,000	22	331	−27.1	36	27	327	−29.1	37	30	318	−37.2	39	31	331	−26.8	52	29	332	−26.9	23					30	323	−33.6	17
10,000	21	288	−35.0	34	23	284	−36.6		29	275	−44.5		30	288	−34.5	51	29	288	−34.0	22					29	280	−40.6	
11,000	20	249	−43.1		23	246	−44.5		29	237	−50.4		30	249	−42.5		29	249	−40.9						29	241	−47.0	
12,000	20	214	−51.1		20	211	−52.0		29	203	−54.8		30	214	−50.5		29	215	−47.8						28	207	−52.0	
13,000	18	183	−59.1		19	180	−58.8		29	173	−57.0		29	183	−58.3		28	184	−54.5						28	177	−55.8	
14,000	18	156	−66.8		19	153	−63.5		29	148	−58.9		27	156	−65.3		28	158	−60.6						27	152	−58.7	
15,000	15	132	−72.3		19	130	−67.4		28	126	−60.0		27	132	−71.1		26	134	−65.5						25	129	−60.8	
16,000	14	112	−74.9		19	110	−69.2		27	107	−60.1		27	112	−73.7		25	114	−68.6						22	110	−62.1	
17,000	10	94	−74.0		18	93	−69.2		24	91	−59.7		25	94	−72.1		22	96	−68.8						21	93	−62.0	
18,000	6	79	−68.2		15	79	−67.6		18	78	−58.6		22	79	−68.3		17	81	−66.6						20	79	−60.8	
19,000					14	67	−65.3		8	66	−56.9		15	67	−64.2		12	69	−63.6						14	68	−59.0	
20,000					10	57	−62.9						8	57	−60.9		6	58	−60.2						7	57	−57.0	
21,000					5	48	−60.8																					

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)				Pensacola, Fla.[1] (24 m.)				Phoenix, Ariz. (339 m.)				Portland, Maine (19 m.)				St. Louis, Mo. (171 m.)				St. Paul, Minn. (225 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	969	21.3	78	31	979	18.0	81	19	1,015	26.6	85	31	968	24.4	48	31	1,014	12.0	82	31	996	20.4	74	31	987	15.9	77
500	31	957	22.1	73	31	956	19.0	69	19	961	23.9	76	31	951	28.1	33	31	958	14.5	68	31	959	21.3	65	31	956	15.4	71
1,000	31	904	21.4	66	31	902	17.8	65	19	908	21.1	67	31	898	26.3	27	31	903	12.8	66	31	906	19.0	64	31	901	13.8	68
1,500	31	854	19.0	67	31	851	16.1	61	19	856	18.1	67	31	849	22.8	27	31	851	10.8	66	31	854	16.5	63	31	849	12.2	64
2,000	31	805	15.9	67	31	802	13.7	60.	19	807	15.2	67	31	801	18.7	32	31	801	8.8	59	31	805	14.2	59	31	799	10.2	61
2,500	31	759	12.9	62	31	756	10.9	59	19	761	12.3	65	31	755	14.5	40	31	754	7.0	54	31	759	11.8	53	31	752	7.8	57
3,000	31	715	10.3	58	31	712	7.9	58	19	717	9.6	61	31	711	10.7	42	31	709	4.5	52	31	714	8.8	50	31	708	5.4	51
4,000	30	633	5.0	49	30	630	2.6	53	19	635	4.2	61	31	630	5.1	35	31	627	.7	48	30	633	3.8	45	30	626	.2	48
5,000	29	560	−.5	44	30	556	−3.1	47	19	561	−1.4	58	31	557	−0.4	27	31	553	−6.1	47	30	559	−1.8	40	29	552	−5.4	44
6,000	28	493	−6.5	42	29	489	−9.3	43	19	494	−7.0	50	29	491	−6.5	23	31	486	−12.2	44	30	492	−8.0	33	29	485	−11.5	40
7,000	28	433	−13.0	39	27	429	−16.0	40	18	434	−13.4	47	27	431	−13.6	20	30	425	−19.3	43	29	432	−14.4	28	28	425	−18.1	36
8,000	27	379	−19.8	37	26	375	−22.6	38	14	380	−20.2	47	27	378	−20.7	19	30	371	−26.5	42	28	378	−21.4	27	28	371	−24.7	34
9,000	27	330	−26.7	37	23	326	−29.1	37	13	332	−27.6	45	27	329	−27.9	19	30	322	−33.9	40	28	329	−28.5	26	28	323	−31.7	36
10,000	27	288	−33.7	37	23	284	−36.1	35	8	288	−34.9		27	286	−35.0	19	30	279	−41.4		28	286	−35.7	25	28	280	−38.4	36
11,000	27	248	−41.1		23	245	−43.4		5	249	−42.2		26	247	−41.8		30	240	−48.2		28	247	−42.8		27	242	−44.7	
12,000	27	214	−48.4		20	211	−50.4						26	213	−48.4		29	206	−54.3		27	213	−49.8		27	208	−50.1	
13,000	27	184	−54.8		18	181	−56.4						25	183	−54.4		28	176	−58.8		27	182	−56.2		23	178	−55.3	
14,000	27	157	−60.7		17	154	−61.0						25	156	−59.5		25	150	−62.1		27	155	−61.7		21	152	−59.7	
15,000	26	133	−65.7		17	131	−63.9						20	133	−63.9		24	127	−64.0		27	132	−65.7		21	129	−61.6	
16,000	24	113	−68.2		16	111	−64.9						17	113	−67.3		22	108	−63.9		27	112	−67.1		21	110	−62.3	
17,000	23	95	−68.6		15	94	−64.9						17	95	−67.1		18	92	−62.2		25	94	−65.9		18	93	−61.1	
18,000	21	80	−66.4		14	80	−62.6						15	81	−64.8		12	78	−59.6		23	80	−63.2		15	79	−59.3	
19,000	14	68	−62.9		12	68	−59.8						7	69	−61.0		6	66	−56.4		18	68	−60.6		8	67	−57.5	
20,000	5	58	−59.8		8	58	−57.6														12	58	−57.8		6	57	−55.3	

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during September 1941*—Continued

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	San Diego, Calif.[1] (19 m.)				San Antonio, Tex. (174 m.)				Sault Ste. Marie, Mich. (221 m.)				Seattle, Wash.[1] (27 m.)				Spokane, Wash. (598 m.)				Washington, D. C. (5 m.)				Anchorage, Alaska (42 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	1,008	18.6	83	31	993	25.1	82	31	989	12.3	89	29	1,013	13.7	85	31	944	11.8	75	31	1,017	20.5	74	31	1,006	11.3	70
500	30	953	16.7	79	31	958	24.0	83	31	957	12.8	84	29	957	11.3	85					31	963	20.3	62	31	952	9.2	67
1,000	30	899	18.0	54	31	905	22.0	77	31	902	11.1	79	29	902	8.6	84	31	899	11.3	67	31	909	17.8	60	31	896	6.0	71
1,500	30	848	17.3	37	31	854	19.5	76	31	849	9.0	74	29	849	5.8	86	31	847	7.9	67	31	857	15.5	58	31	843	2.6	74
2,000	30	800	15.5	31	31	806	16.8	74	31	799	7.3	66	29	798	3.0	85	31	797	4.1	70	31	808	13.4	54	31	792	−.7	75
2,500	30	753	13.1	26	31	760	14.2	68	31	752	5.3	59	29	750	0.1	77	31	749	0.6	73	31	761	11.3	49	31	744	−3.7	72
3,000	30	710	10.7	21	31	716	11.6	64	31	707	3.3	58	29	704	−2.4	70	30	703	−2.6	73	31	717	8.9	43	31	698	−6.5	69
4,000	30	629	5.2	15	31	635	6.9	53	30	624	−2.2	54	29	620	−8.0	60	29	620	−8.2	68	31	635	4.0	36	30	613	−12.3	63
5,000	30	555	−0.9	15	30	561	1.2	52	30	550	−7.6	56	29	544	−14.1	55	29	544	−14.6	65	31	560	−1.1	30	28	537	−18.5	57
6,000	30	489	−7.5	19	30	495	−4.2	47	30	483	−13.4	52	29	476	−20.9	58	29	476	−21.4	61	30	494	−6.9	25	27	469	−25.0	56
7,000	28	430	−14.9	19	30	436	−10.4	42	28	423	−20.0	45	29	415	−27.8	57	29	415	−28.3	59	30	434	−13.2	25	27	408	−32.0	55
8,000	22	376	−22.5		29	382	−17.2	39	28	368	−27.2	44	29	361	−34.5	60	28	360	−35.5	58	30	380	−20.2	25	26	353	−39.0	56
9,000	22	327	−30.1		29	333	−24.0	39	28	320	−34.6	44	28	312	−41.1		27	311	−42.4		30	331	−27.6	24	25	304	−45.2	
10,000	21	284	−37.2		27	290	−30.9	39	27	277	−41.2		28	269	−47.5		27	268	−48.6		30	288	−35.0	22	23	262	−49.0	
11,000	19	245	−44.1		27	252	−38.1	37	27	238	−47.2		28	231	−52.1		26	230	−53.4		30	249	−42.4		23	225	−49.4	
12,000	17	211	−50.7		27	217	−45.6		25	204	−52.7		26	198	−53.9		26	196	−53.8		30	214	−49.6		23	193	−48.8	
13,000	13	181	−55.9		26	187	−53.2		23	174	−57.6		25	170	−55.3		25	168	−54.1		30	184	−56.2		19	166	−48.8	
14,000	11	154	−60.8		24	159	−60.5		21	148	−60.5		23	146	−55.7		24	143	−54.6		30	156	−61.5		19	143	−49.7	
15,000	9	132	−64.1		21	135	−66.8		20	126	−61.8		21	124	−55.7		21	123	−55.2		30	133	−65.5		18	123	−50.2	
16,000	7	111	−66.4		18	115	−71.5		16	107	−61.5		19	106	−55.3		15	105	−55.0		27	113	−67.8		16	106	−50.4	
17,000	6	95	−66.4		17	96	−72.1		10	91	−60.0		13	90	−55.0		9	89	−54.9		25	96	−67.1		16	91	−50.5	
18,000	6	81	−65.1		17	81	−69.9		7	77	−58.4		6	77	−55.0		6	76	−53.9		25	81	−64.9		10	78	−50.9	
19,000			−66.7		15	69	−66.2						6	65	−55.0						20	69	−62.8		8	67	−50.9	
20,000					13	58	−62.2														13	58	−60.2					
21,000					9	49	−58.2														6	50	−57.5					

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Juneau, Alaska (49 m.)				Atlantic Station No. 1 (3 m.)[3]				Atlantic Station No. 2 (3 m.)[4]				Barrow, Alaska (6 m.)				Bethel, Alaska (7 m.)				Coco Solo, C. Z.[1,2] (15 m.)				Fairbanks, Alaska (156 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	1,006	11.0	77	27	1,017	21.8	72	27	1,016	20.9	78					29	1,009	10.2	76	18	1,011	26.2	93	31	994	9.8	56
500	31	952	9.7	73	27	961	17.7	79	27	959	16.8	84					29	952	8.8	78	18	956	24.6	81	31	954	7.1	56
1,000	31	897	6.5	73	27	906	14.4	83	27	904	13.4	86					29	896	6.2	79	18	903	22.0	75	31	898	3.3	61
1,500	31	843	3.2	75	27	854	12.4	72	27	852	10.8	83					29	842	3.5	80	18	852	19.3	70	31	843	−.3	65
2,000	31	792	0.1	77	27	804	11.3	56	27	802	9.0	77					29	792	1.0	78	18	803	16.2	67	31	792	−2.9	66
2,500	31	744	−3.0	77	27	758	9.5	45	27	755	7.8	67					29	744	−1.5	75	18	757	13.6	53	31	743	−5.5	65
3,000	31	698	−5.9	78	27	713	7.3	40	27	710	5.6	62					28	698	+4.4	74	17	713	10.7	48	31	697	−8.4	62
4,000	31	614	−12.0	74	26	631	2.6	33	26	628	0.2	59					28	614	−10.2	68	9	632	3.1	53	31	612	−14.7	58
5,000	31	538	−18.6	71	25	557	−2.7	29	26	554	−5.2	52					27	539	−16.8	68					31	536	−21.2	56
6,000	31	470	−25.3	69	25	490	−8.5	29	26	486	−11.1	47					27	471	−23.0	64					31	467	−28.3	56
7,000	29	408	−32.1	67	25	431	−14.9	28	23	427	−17.2	45					27	410	−29.4	61					30	405	−35.3	53
8,000	28	354	−39.1	63	25	377	−21.9	28	22	373	−23.9	43					25	356	−36.4	59					29	350	−41.9	
9,000	23	305	−45.5		24	328	−28.7	27	21	324	−31.3	40					23	307	−42.7						27	302	−47.5	
10,000	22	262	−49.8		24	285	−36.0	24	21	281	−38.5	38					23	264	−47.4						26	259	−51.3	
11,000	19	225	−50.2		24	246	−43.1		21	242	−45.6						23	228	−47.2						25	222	−51.7	
12,000	18	193	−48.4		24	212	−50.4		19	208	−52.2						22	196	−46.5						25	190	−50.1	
13,000	18	166	−48.3		24	182	−56.5		19	178	−56.6						21	168	−46.7						25	164	−49.6	
14,000	17	142	−48.8		22	155	−60.7		19	151	−59.9						21	145	−46.9						24	140	−49.9	
15,000	17	122	−49.3		22	132	−64.2		18	129	−61.9						19	124	−47.5						22	120	−50.0	
16,000	16	105	−49.9		21	112	−66.1		16	110	−62.2						15	107	−47.9						16	103	−50.1	
17,000	12	90	−49.9		21	94	−65.6		13	93	−61.3						12	92	−48.1						10	88	−50.2	
18,000	5	77	−50.1		18	80	−63.1		9	79	−59.3						6	79	−48.2									
19,000					11	68	−59.8																					
20,000					5	58	−57.0																					

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during September 1941*—Continued

Altitude (meters) M. S. L.	Stations with elevations in meters above sea level																							
	Ketchikan, Alaska (26 m.)				Nome, Alaska (14 m.)				Pearl Harbor, T. H. (7 m.) [1]				San Juan, P. R. (15 m.)				St. Thomas, V. I.[1 2] (8 m.)				Swan Island, West Indies (10 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
Surface	30	1,008	11.9	82	30	1,010	9.5	70	21	1,013	24.7	78	31	1,012	25.5	90					31	1,010	27.8	82
500	30	953	10.7	81	29	952	6.2	72	21	957	21.7	84	31	959	23.6	87					31	956	24.6	88
1,000	30	897	7.5	82	29	896	3.2	72	21	904	18.6	86	31	906	20.9	85					31	903	21.9	82
1,500	30	844	4.0	83	29	842	.9	72	21	853	15.8	81	31	855	18.2	84					31	852	19.2	78
2,000	30	793	0.6	85	29	791	−1.1	67	21	804	13.4	75	31	806	15.4	75					31	804	16.7	72
2,500	30	745	−2.2	80	29	742	−3.9	66	21	758	11.5	62	31	759	13.6	69					31	758	14.1	69
3,000	30	699	−5.1	75	29	697	−6.6	64	21	713	9.1	54	31	716	11.0	65					31	714	11.3	65
4,000	30	615	−11.3	67	28	612	−12.0	56	21	631	3.8	47	30	634	5.0	60					30	633	5.7	60
5,000	29	539	−18.2	64	28	537	−18.4	55	21	557	−2.0	43	30	561	−0.8	58					30	560	.2	57
6,000	28	470	−24.2	61	28	469	−25.2	51	21	490	−8.0	41	29	494	−6.6	58					29	494	−5.9	58
7,000	28	409	−32.3	61	29	407	−32.1	50	21	430	−14.8	39	29	435	−12.7	56					29	434	−11.6	56
8,000	28	354	−39.1	62	27	353	−39.2	50	20	377	−21.9	36	28	380	−19.5	53					28	381	−17.8	52
9,000	28	305	−45.2		25	305	−45.3		20	328	−29.7	33	28	331	−26.8	53					28	332	−24.5	48
10,000	24	262	−48.8		25	262	−50.1		20	285	−37.2	33	28	288	−34.5	52					28	289	−31.7	47
11,000	21	226	−50.3		25	225	−50.5		19	246	−44.5		27	250	−42.3						28	250	−39.1	
12,000	19	193	−49.3		23	193	−49.5		18	211	−52.0		27	215	−50.4						28	216	−46.7	
13,000	19	166	−49.4		22	166	−49.0		16	180	−58.8		26	184	−58.4						28	185	−54.4	
14,000	18	142	−50.3		21	142	−49.2		14	154	−65.1		25	156	−65.6						27	158	−62.3	
15,000	17	122	−51.3		20	122	−49.3		10	130	−69.8		25	132	−71.5						27	134	−69.6	
16,000	10	104	−51.5		20	105	−49.3		8	110	−72.8		24	112	−74.6						26	113	−75.3	
17,000					18	90	−49.3		6	93	−73.6		23	94	−74.0						25	95	−76.8	
18,000					14	78	−49.5		5	78	−75.7		21	79	−72.6						21	80	−74.8	
19,000					11	67	−49.9						17	67	−69.7						14	67	−72.2	
20,000					5	57	−50.2						11	57	−65.1						8	57	−68.5	
21,000													8	48	−61.1									
22,000													7	41	−58.4									
23,000													7	34	−56.2									
24,000													7	29	−53.9									
25,000													5	25	−52.7									

[1] U. S. Navy.
[2] Airplane observations.
[3] Observations made on Coast Guard vessels in or near the 5° square. Lat. 35°00′ N. to 40°00′ N. Long. 55°00W. to 60°00′ W.
[4] Observations made on Coast Guard vessels in or near the 5° square. Lat. 35° 0′ N. to 40°00′ N. Long. 45°00 W to 50°00′ W.

NOTE.—All observations taken at 12:30 a. m. from September 1 thru 14, and at 11 p.m. thereafter 75th meridian time. except at Lakehurst N. J. where they are taken near 5 a.m. E. S. T., at Norfolk Va., where they are taken at about 6 a. m. and at Pearl Harbor, T. H. at 7 a. m.

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 −40.0° C.

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during September 1941. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (866 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	162	3.8	30	215	2.6	30	104	1.3	25	252	1.0	27	234	2.4	29	314	4.0
500							30	94	1.8									
1,000	30	154	4.8				30	111	1.8				27	256	2.6	29	314	3.9
1,500	30	162	5.5				30	119	1.9	25	247	2.1	24	241	4.3	29	303	4.0
2,000	28	171	5.8	30	212	3.8	29	113	2.1	24	251	2.9	22	242	5.7	29	298	3.7
2,500	26	178	5.1	30	222	3.7	28	137	0.9	21	247	5.4	21	249	7.6	29	268	5.0
3,000	23	189	4.3	29	231	4.6	27	128	1.0	20	254	6.4	20	254	10.8	29	265	5.1
4,000	22	229	4.6	27	260	7.7	24	122	1.3	16	242	9.6	20	252	13.3	29	272	6.3
5,000	20	237	4.7	25	258	10.0	22	195	0.2	14	248	13.1	20	255	16.2	23	269	8.6
6,000	19	249	5.0	21	253	12.3	21	186	0.6	12	251	18.9	16	251	20.1	19	289	8.4
8,000	17	250	9.3	20	251	15.4	18	329	1.4				13	247	27.5	12	327	10.9
10,000	15	258	14.8	17	254	18.6	16	328	4.1									
12,000	14	252	16.0	11	244	19.8	14	313	7.6									
14,000	11	262	17.8				10	341	11.7									

Altitude (meters) m. s. l.	Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (17 m.)			Chicago, Ill. 192 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	111	3.7	30	246	4.2	30	206	1.4	30	105	1.6	29	222	1.8	30	202	0.9	29	135	1.9
500	30	119	5.2	30	245	6.0	30	225	3.7	30	102	3.0	29	217	2.8	30	220	1.8			
1,000	27	125	3.9	29	245	8.3	30	260	6.3	29	86	1.8	29	231	5.1	29	217	2.9			
1,500	24	125	2.6	28	255	9.0	30	269	8.4	29	47	1.3	27	239	7.0	29	235	3.5			
2,000	23	123	2.5	26	260	9.7	26	276	8.8	27	20	0.8	24	247	8.5	28	248	5.0	29	133	1.6
2,500	20	124	3.1	22	276	9.6	21	285	9.8	25	17	0.8	22	256	8.6	27	253	6.4	29	170	1.6
3,000	17	124	4.4	19	281	10.5	16	299	11.8	23	16	1.0	21	253	9.8	23	266	6.5	28	217	4.0
4,000	16	106	2.7	17	287	12.0				19	289	0.8	19	274	10.5	21	268	6.8	24	248	7.7
5,000	14	103	3.0	15	287	11.0				16	326	1.7	17	272	12.9	17	280	5.8	22	256	11.6
6,000	12	116	3.1	14	290	12.7				13	10	2.0	17	269	15.2	15	286	5.2	20	257	15.4
8,000				12	282	13.6							12	275	16.3	10	321	5.8	14	271	17.8
10,000													10	281	19.2				13	268	19.4
12,000																					
14,000																					

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during September 1941. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*—Continued

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)			Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (14 m.)			Las Vegas, Nev. (570 m.)			Little Rock, Ark. (79 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (10 m.)			Minneapolis, Minn. (265 m.)			Mobile, Ala. (8 m.)			Nashville, Tenn. (194 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	178	2.7	30	241	2.2	29	277	0.6	29	75	1.0	25	264	2.5	29	70	3.9	30	184	1.2	28	121	1.3	30	315	2.5	30	86	3.7	29	219	3.3	30	134	2.0	30	188	1.3
500	---	---	---	---	---	---	---	---	---	29	80	1.0	---	---	---	29	77	5.3	---	---	---	28	151	2.6	30	319	2.5	30	87	4.6	29	217	4.8	30	123	4.2	30	182	1.6
1,000	---	---	---	---	---	---	---	---	---	29	179	0.7	25	263	4.5	26	91	3.9	30	196	2.0	26	165	3.1	30	315	1.8	30	91	4.3	29	215	6.4	29	119	4.7	30	203	2.0
1,500	30	178	2.7	---	---	---	---	---	---	29	215	1.2	25	267	6.1	26	115	2.8	30	204	2.3	25	177	3.3	30	294	1.2	30	103	4.3	28	229	8.2	27	118	4.7	30	210	1.7
2,000	30	190	2.2	30	240	2.8	29	254	1.8	29	252	1.5	25	262	7.2	24	111	2.1	30	209	3.1	24	179	3.3	28	299	0.7	29	100	3.8	20	243	9.7	22	104	4.3	27	218	2.9
2,500	30	205	2.8	30	247	3.3	29	226	3.8	28	292	2.2	24	264	8.7	23	107	2.0	30	231	3.6	22	196	4.1	26	320	1.9	29	98	3.8	16	242	8.5	18	111	3.7	25	229	3.5
3,000	28	227	3.6	29	244	3.6	28	226	5.8	26	316	2.9	23	263	8.6	20	118	1.7	30	236	4.7	18	227	4.0	27	323	3.4	28	104	3.8	15	249	10.2	15	123	3.6	23	240	3.5
4,000	22	245	5.9	28	242	5.9	25	231	7.8	24	313	3.8	17	256	8.2	14	124	1.6	29	241	7.9	17	225	5.3	23	326	7.0	26	112	3.6	11	268	14.4	12	145	2.9	18	265	6.2
5,000	16	251	7.4	24	252	11.4	21	244	10.9	23	300	3.2	14	266	10.4	12	111	1.5	27	250	9.4	13	244	7.6	23	314	9.4	22	116	3.7	11	276	18.4	10	134	3.3	15	264	5.7
6,000	13	250	8.8	22	252	14.0	20	249	15.0	23	313	4.5	10	267	13.5	12	33	1.2	27	253	13.4	10	247	7.0	23	307	11.4	20	120	3.2	---	---	---	---	---	---	10	292	3.5
8,000	---	---	---	20	259	18.9	11	284	14.0	22	308	4.6	---	---	---	12	31	1.4	24	256	15.5	---	---	---	20	306	16.4	13	78	2.8	---	---	---	---	---	---	---	---	---
10,000	---	---	---	18	268	19.7	---	---	---	21	324	4.3	---	---	---	10	184	1.1	19	278	14.4	---	---	---	15	298	17.7	---	---	---	---	---	---	---	---	---	---	---	---
12,000	---	---	---	17	272	21.5	---	---	---	15	302	2.4	---	---	---	10	261	2.8	17	268	19.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14,000	---	---	---	15	264	21.2	---	---	---	---	---	---	---	---	---	10	2	1.1	12	260	18.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16,000	---	---	---	12	257	15.3	---	---	---	---	---	---	---	---	---	---	---	---	10	261	11.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Altitude (meters) m. s. l.	New York N. Y. (15 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			San Antonio, Tex. (180 m.)			San Diego, Calif. (15 m.)			Sault St. Marie, Mich. (230 m.)			Seattle, Wash. (12m.)			Spokane, Wash. (603 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	216	1.8	30	281	5.3	28	164	5.2	29	173	2.7	30	273	0.9	30	356	1.2	30	166	2.2	30	97	3.2	30	274	4.5	26	238	1.9	28	199	2.3	28	237	2.9	30	204	1.2
500	30	242	3.5	30	295	2.7	28	166	6.1	29	182	4.4	30	266	1.0	---	---	---	30	183	3.5	30	101	4.7	30	293	2.6	26	229	4.0	28	215	3.5	---	---	---	30	220	1.8
1,000	30	265	5.2	29	328	1.8	28	172	7.2	28	198	6.8	30	235	1.4	30	352	1.1	29	202	4.3	29	105	4.6	29	211	0.8	24	226	6.1	26	229	4.8	28	237	4.2	28	251	2.7
1,500	29	277	6.7	29	338	1.8	28	191	6.8	28	210	8.1	30	201	2.8	30	298	1.3	29	215	5.1	29	112	4.3	29	238	0.2	21	241	6.3	22	240	4.1	27	237	4.3	26	281	3.3
2,000	25	283	6.7	29	313	1.4	27	204	6.6	25	227	9.7	30	198	3.6	26	244	3.4	27	223	5.8	25	133	4.0	27	258	1.7	14	256	7.8	18	246	4.1	23	249	4.9	24	298	4.7
2,500	21	290	7.2	29	340	1.9	25	210	7.3	21	245	9.9	30	205	5.4	24	246	6.0	25	231	5.8	24	142	3.7	27	257	3.2	14	264	9.0	17	267	5.3	16	258	6.4	24	289	5.6
3,000	17	312	7.4	29	334	2.8	22	217	7.6	18	242	10.8	29	220	5.9	23	245	8.0	22	242	6.8	22	147	3.2	26	260	6.1	12	264	9.0	13	296	6.1	13	277	5.8	23	290	5.8
4,000	13	309	7.9	29	312	5.3	16	237	7.8	17	257	13.6	28	225	7.5	22	252	13.3	22	247	8.3	16	171	1.8	23	268	8.4	10	283	10.1	10	308	9.5	---	---	---	21	292	6.5
5,000	10	323	8.1	29	301	7.9	14	245	8.5	16	262	14.7	27	240	9.0	18	249	15.4	20	255	10.0	13	201	2.3	17	274	8.3	---	---	---	---	---	---	---	---	---	19	308	5.7
6,000	---	---	---	28	293	9.9	11	252	10.4	14	260	17.9	23	255	9.3	18	248	17.4	18	257	10.9	13	205	2.2	10	275	7.5	---	---	---	---	---	---	---	---	---	18	305	6.5
8,000	---	---	---	21	291	10.9	---	---	---	11	258	21.6	21	250	12.0	13	251	21.4	17	268	13.3	10	264	2.3	---	---	---	---	---	---	---	---	---	---	---	---	13	322	6.8
10,000	---	---	---	18	280	13.0	---	---	---	---	---	---	17	254	17.4	---	---	---	13	271	9.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12,000	---	---	---	15	280	15.3	---	---	---	---	---	---	11	248	17.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14,000	---	---	---	---	---	---	---	---	---	---	---	---	11	252	20.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 3.—*Maximum free-air wind velocities, (m. p. s.), for different sections of the United States, based on pilot balloon observations during September 1941*

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]	40.9	WSW	1,020	25	Buffalo, N. Y.	53.6	WNW	4,780	7	Boston, Mass.	64.0	WNW	9,460	2	Boston, Mass.
East-Central [2]	31.4	SSW	1,470	25	Knoxville, Tenn.	32.4	W	3,660	28	Cincinnati, Ohio	62.0	WNW	19,240	12	Louisville, Ky.
Southeast [3]	23.2	E ESE ENE	1,000 620 820	29 22 20	Key West, Fla.; Mobile, Ala.; Tallahassee, Fla.	20.4	SE	2,610	9	Tampa, Fla.	45.0	WSW	17,670	27	Tampa, Fla.
North-Central [4]	37.6	W	1,741	6	Green Bay, Wis.	47.4	W	5,000	30	Fargo, N. Dak.	68.8	WNW	10,420	10	Fargo, N. Dak.
Central [5]	44.5	WSW	1,100	27	Des Moines, Iowa	42.0	WNW	5,000	5	Des Moines, Iowa	62.4	SW	11,880	9	Wichita, Kans.
South-Central [6]	37.2	S	1,630	24	Jackson, Miss.	29.4	WNW	2,870	24	Little Rock, Ark.	56.0	SW	13,310	9	Abilene, Tex.
Northwest [7]	42.0	W	1,540	15	Great Falls, Mont.	33.0	NNW	4,640	7	Medford, Oreg.	57.0	N	8,900	7	Ellensburg, Wash.
West-Central [8]	48.6	SSW	2,080	19	Modena, Utah	55.0	SSW	4,340	18	Ely, Nev.	70.4	WSW	10,910	11	Reno, Nev.
Southwest [9]	35.2	S	1,860	20	Albuquerque, N. M.	54.4	SSW	3,750	28	Tucson, Ariz.	67.0	SW	13,380	20	Winslow, Ariz.

[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.