## NOTES AND REVIEWS

W. E. KNOWLES-MIDDLETON. Meteorological Instruments. Toronto (University of Toronto Press), 1941. 213 pp., 160 figs.

This volume is the first general textbook on its subject in the English language to be published since Cleveland Abbe's *Treatise on Meteorological Apparatus and Methods* in the "Report of the Chief Signal Officer for 1887." The successive chapters cover the instruments commonly used to measure atmospheric pressure, surface temperature (air, soil, and water), humidity, precipitation and evaporation, surface wind (speed and direction), upper-air wind velocity, the motions and heights of clouds and the sizes of cloud or fog droplets, and the duration of sunshine. A concluding chapter is devoted to meteorographs and radiosondes. Numerous references to the literature are included throughout the book.

**Charles B. Tuch,** the designer of the barometer cistern that bears his name, died in Washington, D. C., on August 1, 1941, at the age of 91, and was buried in Arlington National Cemetery with military honors.

During the early years of the Weather Bureau, first under the Signal Corps (in which he enlisted on April 11, 1879) and later under the Department of Agriculture, Mr. Tuch was engaged in the instrument work of the Bureau, where his faithful and conscientious services were of the greatest value. He became the head instrument maker; and had charge particularly of the repair, calibration, and shipping of mercurial barometers, in which he excelled anyone else. Prior to about 1890, the only *self-recording* instrument at any of the field stations was the Gibbon anemometer register; as barographs, thermographs, and other self-recording instruments were introduced later, their care was also assigned to Mr. Tuch.

The two mercurial barometers with which each station has always been equipped were perhaps the most important of all the instruments at the stations. Mr. Tuch's chief duties were to maintain the readings of these at the highest possible accuracy. At that time the barometers were of the so-called "Fortin" type, having glass and boxwood cisterns with chamois skin bags permitting of the adjustment of the mercury level. The maintenance of these instruments involved not only the cleaning and frequent renewal of the cisterns, but also the fitting of new glass barometer tubes, which had first to be filled with vacuum-distilled mercury of the highest possible purity. Before issue for use, each instrument had to be carefully compared, by readings extending over several days, with the primary standards of the Bureau, and its scale adjusted until the correction for instrumental error was found to be no greater than four thousandths of an inch. The experience gained in this work led to the invention of the so-called Tuch barometer cistern, in which the perishable boxwood chamois skin container for the mercury was replaced by a sturdy metal cylinder with mercury-tight plunger to adjust the level of the mercury to the ivory point for a reading.

Mr. Tuch remained connected with the Weather Bureau until 1916.

## METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR NOVEMBER 1941

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

### AEROLOGICAL OBSERVATIONS

By HOMER D. DYCK

Mean surface temperatures for November were from 2° to 4° F. above normal over most of the country with the exception of an area in the central Gulf States which was slightly below normal.

At 1,500 meters above sea level the 5 a. m. resultant winds for November were from directions to the south of normal over most of the country with the exception of Texas and Oklahoma, where they were from directions to north of normal. Although a comparison of the morning resultant winds at 3,000 meters was not possible for the lake region, the Ohio Valley, California, and Nevada, the winds at this level were from directions to the south of normal over most of the rest of the United States with the exception of New Mexico, Oklahoma, and Texas, where resultant winds were to north of normal. At 5,000 meters a good comparison of the 5 p. m. resultant winds with the corresponding 5 a. m. normals was not possible over most of the country. It may be noted, however, that these afternoon winds were from directions to north of normal over California and the southern plateau region and from south of normal over the central Great Plains.

At 1,500 meters resultant wind velocities were above normal over the northern half of the country, west of the Rockies generally and over the central Gulf States, and below normal elsewhere. At 3,000 meters a comparison, of wind velocities, was not possible over the lake region, the Ohio Valley, California, and Nevada, but resultant velocities were below normal generally over the southeast, the southern plateau and extreme northern Montana and above normal elsewhere. At 5,000 meters all stations where a comparison of the 5 p. m. resultant velocities with the corresponding 5 a. m. normals was possible, had above normal velocities. These stations were located over the western half of the country and the central and southern Great Plains.

A correlation between mean surface temperature departures and deviations from normal resultant wind directions is evident. At both 1,500 and 3,000 meters there are areas where a turning to northward of normal took place which have the same general shape as the area where below normal surface temperatures occurred. These areas where the winds turned to northward are, however, displaced somewhat to westward of the area where below-normal temperatures were recorded. The remainder of the country recorded above-normal temperatures and resultant winds to south of normal generally.

When the 5 p. m. resultant directions are compared to the corresponding 5 a. m. resultant directions, a turning to northward during the day is noted at the 1,500 meter level over the lake region, the upper Mississippi Valley, Alabama, Georgia, and South Carolina, while a turning to southward occurred over the rest of the country generally. At the 3,000 meter level no well marked pattern of change was evident; it may be noted, however, that the number of stations where turning to southward during the day occurred was about double the number where the opposite shift occurred.

The 5 p. m. resultant velocities at 1,500 meters were lower than the corresponding 5 a. m. velocities over the Atlantic States, the Ohio Valley, the Gulf States, and the northwest generally and were above the morning velocities

over the rest of the country. At 3,000 meters no comparison was possible over the northern part of the country east of the Mississippi, but elsewhere the afternoon wind velocities were generally higher than the morning velocities with the exception of a few scattered stations.

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 mean monthly pressures at each of the several standard levels from 2,000 to 17,000 meters. The highest mean monthly pressure occurred over both Brownsville and Miami at standard levels from 2,000 to 6,000 meters, inclusive. From 7,000 to 14,000 meters, inclusive, Miami recorded the highest mean monthly pressures while at 14,000 meters San Antonio also recorded the maximum. The maximum pressures at the 15,000, 16,000, and 17,000 meter levels were recorded over San Antonio. The lowest mean monthly pressure occurred over Sault Ste. Marie at all levels from 2,000 to 17,000 meters, inclusive. At the 15,000 and 16,000 meter levels, Portland, Maine, also recorded minimum pressures.

Mean pressures at the surface and at 1,000 meters were higher this month than in October over the southern Great Plains, California, and the plateau region with the exception of the State of Washington, and below last month at these levels elsewhere. Up to and including the 3,000 meter level, mean pressures for November were higher than during October over the southern plateau region and California and below last month over the remainder of the country. With the exception of Oakland, which recorded pressures higher than the previous month up to 9,000 meters, all other stations recorded pressures lower than those for October for all levels above 3,000 meters. The decreases from the previous month were quite substantial over the eastern half of the United States amounting to as much as 12 or 13 millibars at from 7,000 to 9,000 meters over some stations in the Lake region and the Mississippi Valley. Pressure gradients this month were steeper than last month over the far northwest and over the South and about the same elsewhere. The steepest upper level pressure gradient for November occurred between Sault Ste. Marie and Joliet at the 6,000 and 7,000 meter levels where there was a change of 1 mb. pressure for each 37 miles of horizontal distance between the two stations.

The mean temperatures for November were considerably lower than October's for all stations and all levels up to about 12,000 meters. Above this level temperatures this month were higher than last month's east of the Rocky Mountains generally and below last month's over the remainder of the country.

Mean temperatures for November 1941 were considerably higher than those for November 1940 over most of the United States at nearly all levels with a few scattered exceptions. These exceptions where lower temperatures occurred were over Brownsville, at levels up to 13,000 meters; over Charleston from 3,000 to 19,000 meters inclusive; over Miami from 3,000 to 13,000 meters, and over Portland, Maine, from 5,000 to 11,000 meters.

At 1,000 meters mean temperatures for November were above normal generally. At 3,000 meters they were also above normal, except for California and the Northeast, while at 5,000 meters mean temperatures were below normal generally over the Pacific coast and the central plateau region, the western lake region, the central Great Plains and the Northeast.

The mean relative humidities for the month at the 1,000-meter level were somewhat below normal over the Middle Atlantic States and parts of the South and somewhat above normal elsewhere. At the 3,000- and 5,000- meter levels, humidities were below normal over the Missouri Valley and Oklahoma and above normal generally elsewhere.

The altitude at which the mean monthly temperature of 0° C. for November occurred varied from the lowest (500 meters) over Sault Ste. Marie, to the highest (4,300 meters) over Miami, Fla. The level, at which, on the average, freezing conditions occurred was lower this month than last over all of the United States. This level was much lower than it was last month over the Lake region, being 2,000 meters lower over Sault Ste. Marie, Mich.

The lowest free-air temperature recorded during the month over the United States was −84.0° C. (−119.2° F.). This temperature occurred over Charleston, S. C., on the morning of November 25 at an altitude of 16,000 meters (about 10 miles) above sea level. The lowest temperature for the month over San Juan, P. R., was −87.3° C. (−125.1° F.), observed at 18,100 meters (about 11.2 miles) above sea level on November 24.

Table 3 shows the maximum free-air wind velocities for various sections of the United States during November as determined by pilot-balloon observations. The highest observed wind velocity for the month was 85 m.p.s. (190 miles per hour) observed over Greensboro, N. C., on November 8. This wind was blowing from the south-southwest at an elevation of 7,650 meters (about 4.8 miles) above sea level.

The highest November wind velocity observed during the last 5 years in the free-air layer from the surface to 2,500 meters was 55.8 m.p.s. (125 miles per hour) observed blowing from the west-northwest on November 14, 1938, over Washington, D. C., at an altitude of 2,500 meters (about 1.6 miles). On this same date and over the same station and blowing from the same direction as the maximum wind described above, the maximum wind in the last 5 years for the level from 2,500 to 5,000 meters was recorded. This wind had a velocity of 69.1 m.p.s. (154 miles per hour) and was blowing at an elevation of 2,620 meters (1.6 miles). During the same 5-year period a still higher wind velocity, 98.4 m.p.s. (220 miles per hour) was observed in the layer above 5,000 meters. This wind was blowing from the north at an elevation of 11,120 meters (about 6.9 miles) over Winnemucca, Nev.; on November 22, 1940.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during November 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 (864 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 | 30 | 840 | 8.0 | 48 | 30 | 985 | 8.9 | 75 | 30 | 955 | −1.0 | 81 | 28 | 920 | 4.2 | 79 | 30 | 1,018 | 17.8 | 87 | 29 | 989 | 5.7 | 72 | 30 | 1,018 | 11.2 | 90 |
| 500 | | | | | 30 | 962 | 11.2 | 60 | | | | | | | | | 30 | 961 | 17.4 | 75 | 29 | 956 | 5.4 | 72 | 30 | 961 | 14.0 | 63 |
| 1,000 | | | | | 30 | 906 | 9.7 | 55 | 30 | 898 | 0.3 | 76 | 28 | 905 | 6.6 | 71 | 30 | 906 | 14.8 | 72 | 29 | 899 | 2.6 | 73 | 30 | 906 | 11.4 | 57 |
| 1,500 | | | | | 30 | 853 | 7.6 | 54 | 30 | 844 | 0.4 | 65 | 28 | 852 | 5.9 | 61 | 30 | 854 | 12.8 | 68 | 29 | 845 | 0.5 | 69 | 30 | 853 | 9.5 | 53 |
| 2,000 | 30 | 802 | 8.5 | 47 | 30 | 802 | 5.7 | 46 | 30 | 793 | −0.6 | 60 | 28 | 801 | 3.4 | 59 | 30 | 805 | 11.4 | 61 | 29 | 794 | −1.3 | 68 | 30 | 803 | 7.4 | 48 |
| 2,500 | 30 | 755 | 5.7 | 46 | 30 | 755 | 3.8 | 38 | 30 | 745 | −2.8 | 56 | 28 | 753 | 0.7 | 59 | 30 | 758 | 9.8 | 55 | 29 | 745 | −4.0 | 66 | 30 | 756 | 5.4 | 42 |
| 3,000 | 30 | 710 | 2.6 | 47 | 30 | 709 | 1.4 | 37 | 30 | 699 | −5.3 | 54 | 28 | 707 | −2.6 | 60 | 30 | 714 | 7.4 | 51 | 29 | 699 | −5.9 | 59 | 30 | 710 | 2.9 | 42 |
| 4,000 | 30 | 626 | −3.3 | 45 | 30 | 626 | −3.5 | 33 | 30 | 614 | −11.3 | 53 | 28 | 623 | −8.4 | 58 | 30 | 631 | 1.1 | 52 | 28 | 615 | −10.6 | 53 | 30 | 628 | −1.9 | 43 |
| 5,000 | 29 | 552 | −9.4 | 37 | 30 | 551 | −9.6 | 29 | 30 | 539 | −17.6 | 51 | 27 | 547 | −14.7 | 58 | 30 | 557 | −4.6 | 48 | 26 | 539 | −16.2 | 48 | 29 | 552 | −8.0 | 40 |
| 6,000 | 29 | 484 | −16.1 | 33 | 30 | 483 | −15.9 | 29 | 30 | 470 | −24.3 | 49 | 27 | 478 | −21.6 | 58 | 29 | 490 | −11.2 | 45 | 25 | 471 | −22.6 | 45 | 29 | 485 | −14.7 | 38 |
| 7,000 | 29 | 423 | −22.9 | 32 | 29 | 423 | −22.6 | 30 | 30 | 409 | −31.1 | 48 | 27 | 417 | −28.5 | 54 | 29 | 429 | −18.0 | 41 | 25 | 410 | −29.1 | 43 | 28 | 424 | −21.8 | 37 |
| 8,000 | 29 | 368 | −30.1 | 31 | 29 | 368 | −29.4 | 30 | 30 | 355 | −38.3 | 48 | 26 | 362 | −35.8 | 52 | 29 | 375 | −25.1 | 39 | 23 | 356 | −35.9 | 41 | 28 | 370 | −29.1 | 37 |
| 9,000 | 29 | 320 | −37.1 | 28 | 29 | 319 | −36.2 | 29 | 29 | 306 | −45.0 | | 26 | 312 | −43.1 | | 26 | 325 | −32.8 | 38 | 21 | 308 | −42.4 | | 28 | 320 | −36.5 | 37 |
| 10,000 | 29 | 276 | −43.8 | | 29 | 276 | −42.4 | | 29 | 263 | −50.5 | | 25 | 269 | −49.8 | | 26 | 282 | −40.5 | | 18 | 265 | −48.1 | | 27 | 277 | −44.0 | |
| 11,000 | 29 | 238 | −49.6 | | 29 | 238 | −47.8 | | 29 | 225 | −54.5 | | 25 | 231 | −54.1 | | 26 | 243 | −47.5 | | 17 | 227 | −51.6 | | 27 | 238 | −50.5 | |
| 12,000 | 29 | 203 | −54.2 | | 29 | 204 | −53.0 | | 28 | 193 | −56.5 | | 24 | 197 | −56.0 | | 24 | 208 | −53.9 | | 15 | 195 | −54.0 | | 27 | 204 | −56.1 | |
| 13,000 | 29 | 174 | −58.2 | | 29 | 174 | −57.6 | | 28 | 164 | −56.9 | | 24 | 169 | −57.1 | | 23 | 178 | −59.4 | | 14 | 166 | −55.4 | | 25 | 173 | −60.9 | |
| 14,000 | 29 | 148 | −60.7 | | 29 | 149 | −61.1 | | 27 | 140 | −56.8 | | 23 | 144 | −58.7 | | 22 | 151 | −64.7 | | 12 | 142 | −56.5 | | 24 | 147 | −65.3 | |
| 15,000 | 27 | 126 | −63.1 | | 26 | 126 | −63.6 | | 27 | 120 | −56.8 | | 23 | 123 | −59.8 | | 21 | 128 | −69.6 | | 10 | 122 | −57.5 | | 23 | 125 | −68.6 | |
| 16,000 | 20 | 107 | −64.8 | | 25 | 108 | −65.4 | | 23 | 102 | −57.5 | | 20 | 104 | −61.2 | | 20 | 108 | −72.5 | | 8 | 104 | −58.2 | | 21 | 105 | −71.1 | |
| 17,000 | 15 | 91 | −65.0 | | 24 | 91 | −66.3 | | 16 | 87 | −58.7 | | 16 | 89 | −61.5 | | 13 | 92 | −74.5 | | 6 | 90 | −58.2 | | 20 | 89 | −72.0 | |
| 18,000 | 6 | 77 | −64.3 | | 21 | 77 | −65.9 | | 6 | 74 | −58.9 | | 11 | 75 | −60.4 | | 8 | 77 | −71.9 | | | | | | 12 | 75 | −71.3 | |
| 19,000 | | | | | 13 | 65 | −64.8 | | | | | | | | | | | | | | | | | | 7 | 63 | −70.1 | |
| 20,000 | | | | | 8 | 55 | −63.6 | | | | | | | | | | | | | | | | | | | | | |

Stations with elevations in meters above sea level

| Altitude (meters) m. s. l. | Denver, Colo. (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 | 28 | 839 | 1.8 | 65 | 30 | 991 | 3.7 | 83 | 25 | 884 | 9.7 | 67 | 30 | 812 | −1.5 | 77 | 29 | 886 | 3.9 | 59 | 30 | 999 | 3.8 | 85 | 30 | 995 | 4.0 | 88 |
| 500 | | | | | 30 | 955 | 4.5 | 76 | | | | | | | | | | | | | 30 | 960 | 7.8 | 65 | 30 | 956 | 5.3 | 82 |
| 1,000 | | | | | 30 | 898 | 3.0 | 71 | | | | | | | | | | | | | 30 | 903 | 5.8 | 60 | 30 | 900 | 3.5 | 78 |
| 1,500 | | | | | 30 | 844 | 1.2 | 64 | 25 | 853 | 11.8 | 57 | | | | | 29 | 848 | 4.8 | 55 | 30 | 850 | 3.4 | 56 | 30 | 846 | 1.8 | 72 |
| 2,000 | 28 | 800 | 6.4 | 49 | 30 | 793 | −0.2 | 56 | 25 | 803 | 9.2 | 55 | 30 | 803 | 1.9 | 71 | 29 | 796 | 1.9 | 53 | 30 | 798 | 1.6 | 53 | 30 | 794 | 0.4 | 67 |
| 2,500 | 28 | 753 | 3.6 | 43 | 30 | 745 | −2.2 | 52 | 25 | 756 | 6.5 | 54 | 30 | 755 | 2.4 | 63 | 29 | 748 | −1.4 | 53 | 30 | 750 | −0.3 | 50 | 30 | 747 | −1.2 | 63 |
| 3,000 | 28 | 707 | 0.1 | 41 | 30 | 699 | −4.6 | 51 | 25 | 711 | 3.7 | 53 | 30 | 709 | −0.1 | 59 | 29 | 702 | −4.3 | 51 | 30 | 705 | −2.3 | 46 | 30 | 700 | −3.6 | 61 |
| 4,000 | 28 | 624 | −7.2 | 41 | 29 | 615 | −10.1 | 48 | 25 | 628 | −1.8 | 48 | 29 | 625 | −6.0 | 57 | 29 | 618 | −10.6 | 48 | 29 | 621 | −7.3 | 40 | 30 | 616 | −8.9 | 57 |
| 5,000 | 27 | 548 | −13.5 | 41 | 29 | 540 | −15.8 | 44 | 25 | 553 | −8.1 | 43 | 29 | 550 | −12.1 | 53 | 29 | 542 | −17.0 | 46 | 29 | 545 | −13.2 | 34 | 30 | 541 | −14.8 | 55 |
| 6,000 | 25 | 479 | −20.1 | 39 | 29 | 472 | −22.3 | 43 | 24 | 485 | −14.1 | 39 | 28 | 481 | −19.2 | 51 | 29 | 473 | −23.8 | 45 | 28 | 477 | −19.9 | 33 | 30 | 474 | −21.2 | 52 |
| 7,000 | 24 | 418 | −26.9 | 37 | 29 | 411 | −29.0 | 42 | 23 | 425 | −20.7 | 38 | 28 | 420 | −26.2 | 51 | 29 | 412 | −31.0 | 44 | 28 | 416 | −26.7 | 32 | 30 | 413 | −28.1 | 50 |
| 8,000 | 23 | 363 | −34.2 | 37 | 28 | 357 | −35.9 | 42 | 23 | 371 | −28.2 | 37 | 28 | 365 | −33.3 | 50 | 28 | 357 | −38.3 | 42 | 27 | 362 | −33.5 | 31 | 30 | 358 | −35.6 | 48 |
| 9,000 | 20 | 314 | −40.9 | | 28 | 308 | −42.9 | | 23 | 321 | −35.5 | 36 | 27 | 315 | −40.0 | 48 | 28 | 308 | −45.3 | | 27 | 313 | −39.9 | | 28 | 309 | −42.8 | |
| 10,000 | 20 | 271 | −46.9 | | 28 | 265 | −48.4 | | 23 | 278 | −43.1 | | 27 | 272 | −46.7 | | 28 | 264 | −51.1 | | 27 | 270 | −45.6 | | 28 | 266 | −48.8 | |
| 11,000 | 17 | 232 | −52.1 | | 28 | 228 | −52.4 | | 23 | 239 | −50.1 | | 27 | 234 | −52.6 | | 27 | 227 | −54.4 | | 27 | 232 | −50.2 | | 26 | 228 | −52.8 | |
| 12,000 | 16 | 199 | −54.9 | | 28 | 195 | −54.8 | | 23 | 204 | −56.2 | | 27 | 200 | −55.9 | | 25 | 194 | −55.6 | | 26 | 199 | −53.8 | | 26 | 195 | −54.6 | |
| 13,000 | 16 | 170 | −57.3 | | 26 | 166 | −56.0 | | 23 | 174 | −59.8 | | 27 | 170 | −58.8 | | 22 | 165 | −56.1 | | 26 | 170 | −56.6 | | 25 | 167 | −56.0 | |
| 14,000 | 14 | 145 | −58.5 | | 26 | 142 | −56.8 | | 23 | 148 | −62.2 | | 25 | 145 | −60.3 | | 20 | 141 | −56.6 | | 23 | 145 | −58.5 | | 23 | 142 | −56.7 | |
| 15,000 | 10 | 124 | −59.7 | | 24 | 121 | −58.3 | | 22 | 126 | −65.3 | | 22 | 124 | −62.4 | | 17 | 120 | −57.2 | | 21 | 123 | −60.4 | | 20 | 121 | −57.7 | |
| 16,000 | 9 | 106 | −60.9 | | 19 | 103 | −59.0 | | 18 | 107 | −66.8 | | 19 | 105 | −64.5 | | 11 | 102 | −59.0 | | 18 | 105 | −61.7 | | 10 | 103 | −58.5 | |
| 17,000 | | | | | 14 | 88 | −59.0 | | 15 | 91 | −67.9 | | 10 | 89 | −65.2 | | 6 | 86 | −60.0 | | 15 | 89 | −62.2 | | 8 | 88 | −59.7 | |
| 18,000 | | | | | 10 | 75 | −59.1 | | 9 | 76 | −68.3 | | | | | | | | | | 7 | 75 | −61.7 | | | | | |
| 19,000 | | | | | 6 | 64 | −58.9 | | 6 | 65 | −66.2 | | | | | | | | | | | | | | | | | |

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during November 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 | 30 | 1,020 | 11.0 | 88 | 29 | 1,014 | 6.4 | 69 | 30 | 970 | 8.1 | 86 | 30 | 1,016 | 20.6 | 90 | 29 | 999 | 6.8 | 79 | 27 | 1,020 | 9.0 | 80 | 30 | 1,018 | 12.2 | 83 |
| 500 | 30 | 962 | 12.7 | 67 | 29 | 959 | 6.9 | 51 | 30 | 959 | 9.5 | 81 | 30 | 960 | 19.8 | 88 | 29 | 961 | 9.3 | 65 | 27 | 960 | 10.7 | 62 | 30 | 960 | 14.0 | 69 |
| 1,000 | 30 | 906 | 11.3 | 58 | 29 | 903 | 4.4 | 49 | 30 | 903 | 9.6 | 67 | 30 | 906 | 16.5 | 88 | 29 | 905 | 7.1 | 58 | 27 | 904 | 8.6 | 57 | 30 | 905 | 12.9 | 56 |
| 1,500 | 30 | 853 | 9.7 | 52 | 29 | 849 | 2.3 | 51 | 30 | 850 | 7.8 | 63 | 30 | 854 | 13.7 | 85 | 29 | 851 | 5.5 | 53 | 26 | 851 | 7.3 | 49 | 30 | 852 | 10.8 | 50 |
| 2,000 | 29 | 803 | 8.3 | 43 | 29 | 797 | 0.4 | 49 | 30 | 800 | 5.2 | 60 | 30 | 805 | 11.7 | 75 | 29 | 800 | 3.6 | 48 | 26 | 801 | 5.5 | 44 | 30 | 802 | 8.4 | 47 |
| 2,500 | 29 | 756 | 6.5 | 39 | 29 | 749 | −1.5 | 49 | 30 | 752 | 2.2 | 57 | 30 | 758 | 9.3 | 65 | 28 | 752 | 1.5 | 41 | 26 | 753 | 3.2 | 39 | 30 | 755 | 5.6 | 45 |
| 3,000 | 28 | 711 | 4.1 | 39 | 29 | 703 | −3.4 | 46 | 30 | 706 | −0.8 | 51 | 30 | 714 | 7.1 | 60 | 28 | 707 | −0.6 | 38 | 26 | 707 | 0.7 | 37 | 30 | 710 | 2.8 | 41 |
| 4,000 | 28 | 628 | −1.7 | 39 | 29 | 618 | −8.9 | 44 | 30 | 622 | −6.9 | 46 | 30 | 631 | 2.1 | 46 | 27 | 623 | −5.4 | 33 | 24 | 623 | −5.0 | 34 | 30 | 626 | −3.2 | 37 |
| 5,000 | 28 | 553 | −7.4 | 35 | 29 | 542 | −14.4 | 38 | 30 | 547 | −13.8 | 44 | 30 | 557 | −4.2 | 42 | 27 | 548 | −11.3 | 30 | 16 | 548 | −11.0 | 31 | 30 | 552 | −9.5 | 33 |
| 6,000 | 28 | 486 | −13.7 | 34 | 29 | 474 | −21.1 | 37 | 30 | 479 | −20.5 | 44 | 29 | 490 | −10.2 | 39 | 27 | 480 | −17.7 | 27 | ---- | ---- | ---- | ---- | 30 | 484 | −15.9 | 32 |
| 7,000 | 27 | 425 | −20.9 | 36 | 29 | 414 | −27.9 | 45 | 30 | 417 | −27.5 | 43 | 29 | 430 | −17.0 | 39 | 26 | 419 | −24.9 | 26 | ---- | ---- | ---- | ---- | 30 | 423 | −22.8 | 31 |
| 8,000 | 27 | 370 | −27.8 | 36 | 28 | 360 | −34.5 | ---- | 30 | 363 | −34.8 | 42 | 29 | 376 | −24.1 | 38 | 24 | 364 | −31.9 | 26 | ---- | ---- | ---- | ---- | 28 | 369 | −29.8 | 31 |
| 9,000 | 27 | 321 | −34.9 | 36 | 27 | 311 | −40.9 | ---- | 30 | 314 | −42.0 | ---- | 29 | 326 | −31.3 | 38 | 23 | 315 | −38.8 | ---- | ---- | ---- | ---- | ---- | 28 | 319 | −37.0 | 31 |
| 10,000 | 27 | 278 | −41.5 | ---- | 27 | 268 | −47.1 | ---- | 30 | 270 | −48.7 | ---- | 29 | 283 | −39.3 | 38 | 21 | 272 | −44.7 | ---- | ---- | ---- | ---- | ---- | 27 | 276 | −43.7 | ---- |
| 11,000 | 27 | 240 | −48.0 | ---- | 26 | 230 | −52.6 | ---- | 30 | 232 | −54.0 | ---- | 29 | 244 | −47.1 | ---- | 21 | 234 | −49.5 | ---- | ---- | ---- | ---- | ---- | 25 | 237 | −50.3 | ---- |
| 12,000 | 27 | 206 | −53.8 | ---- | 24 | 197 | −57.0 | ---- | 30 | 198 | −57.4 | ---- | 27 | 209 | −54.6 | ---- | 20 | 200 | −54.1 | ---- | ---- | ---- | ---- | ---- | 22 | 203 | −55.8 | ---- |
| 13,000 | 27 | 176 | −58.3 | ---- | 23 | 168 | −59.6 | ---- | 27 | 168 | −59.1 | ---- | 26 | 179 | −61.4 | ---- | 18 | 171 | −56.8 | ---- | ---- | ---- | ---- | ---- | 21 | 174 | −58.9 | ---- |
| 14,000 | 26 | 149 | −61.7 | ---- | 22 | 143 | −61.0 | ---- | 26 | 144 | −60.0 | ---- | 25 | 152 | −67.2 | ---- | 18 | 145 | −59.1 | ---- | ---- | ---- | ---- | ---- | 17 | 148 | −60.2 | ---- |
| 15,000 | 23 | 127 | −64.4 | ---- | 17 | 122 | −62.3 | ---- | 24 | 122 | −61.4 | ---- | 24 | 128 | −71.2 | ---- | 16 | 124 | −61.0 | ---- | ---- | ---- | ---- | ---- | 15 | 126 | −60.9 | ---- |
| 16,000 | 22 | 108 | −66.8 | ---- | 12 | 103 | −62.7 | ---- | 21 | 104 | −62.9 | ---- | 24 | 109 | −74.0 | ---- | 14 | 105 | −62.8 | ---- | ---- | ---- | ---- | ---- | 14 | 107 | −62.1 | ---- |
| 17,000 | 20 | 92 | −68.7 | ---- | 8 | 87 | −63.4 | ---- | 13 | 88 | −63.5 | ---- | 18 | 91 | −74.4 | ---- | 14 | 89 | −63.8 | ---- | ---- | ---- | ---- | ---- | 12 | 91 | −62.6 | ---- |
| 18,000 | 12 | 77 | −69.2 | ---- | 6 | 74 | −64.4 | ---- | 6 | 74 | −63.3 | ---- | 10 | 77 | −70.6 | ---- | 12 | 75 | −63.5 | ---- | ---- | ---- | ---- | ---- | 11 | 78 | −62.9 | ---- |
| 19,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 6 | 65 | −67.0 | ---- | 7 | 63 | −63.1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |

Stations with elevations in meters above sea level

| Altitude (meters) m. s. l. | Oklahoma City, Okla. (391 m.) | | | | Omaha, Nebr. (301 m.) | | | | Phoenix, Ariz. (339 m.) | | | | Portland, Maine (20 m.) | | | | St. Louis, Mo. (171 m.) | | | | St. Paul, Minn. (225 m.) | | | | San Antonio, Tex. (174 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 | 974 | 8.5 | 80 | 30 | 982 | 3.6 | 82 | 30 | 975 | 13.0 | 64 | 30 | 1,013 | 2.7 | 77 | 30 | 998 | 6.7 | 76 | 29 | 988 | 2.2 | 77 | 30 | 1,000 | 13.3 | 81 |
| 500 | 30 | 961 | 9.7 | 70 | 30 | 958 | 5.3 | 72 | 30 | 957 | 18.2 | 44 | 30 | 955 | 3.2 | 71 | 30 | 959 | 7.8 | 67 | 29 | 955 | 2.0 | 74 | 30 | 962 | 15.6 | 66 |
| 1,000 | 30 | 905 | 9.1 | 59 | 30 | 901 | 4.9 | 64 | 30 | 903 | 17.2 | 35 | 30 | 898 | 0.9 | 69 | 30 | 902 | 6.1 | 63 | 29 | 898 | 0.5 | 70 | 30 | 907 | 13.3 | 68 |
| 1,500 | 30 | 852 | 7.8 | 53 | 30 | 847 | 4.0 | 57 | 30 | 851 | 14.2 | 34 | 30 | 843 | −0.9 | 68 | 30 | 849 | 4.5 | 60 | 29 | 843 | −0.1 | 61 | 30 | 855 | 11.5 | 68 |
| 2,000 | 30 | 802 | 6.1 | 52 | 29 | 796 | 2.1 | 51 | 30 | 802 | 10.7 | 34 | 30 | 792 | −2.7 | 64 | 30 | 798 | 2.5 | 53 | 29 | 792 | −1.6 | 53 | 30 | 804 | 10.1 | 56 |
| 2,500 | 30 | 754 | 3.8 | 47 | 29 | 748 | −0.1 | 47 | 30 | 754 | 7.5 | 35 | 30 | 743 | −4.9 | 63 | 29 | 750 | 0.7 | 51 | 28 | 744 | −3.4 | 45 | 30 | 758 | 7.8 | 51 |
| 3,000 | 30 | 709 | 1.1 | 43 | 29 | 703 | −2.5 | 42 | 30 | 710 | 4.5 | 35 | 30 | 697 | −7.1 | 62 | 29 | 704 | −2.0 | 50 | 28 | 698 | −5.6 | 41 | 30 | 713 | 5.4 | 48 |
| 4,000 | 30 | 625 | −3.9 | 36 | 28 | 619 | −8.4 | 38 | 29 | 627 | −1.0 | 29 | 30 | 613 | −12.2 | 56 | 28 | 620 | −7.4 | 49 | 26 | 613 | −11.2 | 37 | 30 | 630 | −0.2 | 46 |
| 5,000 | 30 | 550 | −10.2 | 33 | 27 | 544 | −14.7 | 35 | 29 | 553 | −7.0 | 27 | 30 | 537 | −18.3 | 52 | 27 | 545 | −13.1 | 46 | 25 | 538 | −17.7 | 37 | 29 | 556 | −5.6 | 40 |
| 6,000 | 29 | 482 | −16.8 | 31 | 27 | 476 | −21.4 | 34 | 29 | 486 | −13.5 | 27 | 28 | 469 | −24.8 | 51 | 27 | 477 | −19.7 | 44 | 25 | 470 | −24.1 | 36 | 28 | 488 | −11.9 | 38 |
| 7,000 | 28 | 422 | −23.6 | 29 | 26 | 414 | −28.9 | 33 | 29 | 425 | −20.2 | 27 | 28 | 408 | −31.5 | 51 | 27 | 416 | −26.8 | 41 | 25 | 409 | −31.0 | 35 | 27 | 428 | −18.5 | 35 |
| 8,000 | 28 | 367 | −30.7 | 28 | 26 | 360 | −36.3 | 33 | 29 | 370 | −27.0 | 27 | 27 | 353 | −38.7 | 51 | 26 | 361 | −34.1 | 41 | 25 | 355 | −38.2 | 35 | 26 | 373 | −25.3 | 35 |
| 9,000 | 27 | 318 | −37.2 | 28 | 26 | 311 | −42.9 | ---- | 29 | 322 | −34.1 | 27 | 27 | 305 | −45.3 | ---- | 26 | 312 | −41.2 | ---- | 25 | 306 | −45.1 | ---- | 26 | 324 | −32.3 | 34 |
| 10,000 | 26 | 275 | −43.7 | ---- | 26 | 268 | −48.1 | ---- | 28 | 279 | −41.0 | ---- | 27 | 262 | −50.8 | ---- | 25 | 269 | −46.4 | ---- | 25 | 263 | −50.4 | ---- | 26 | 281 | −39.7 | 33 |
| 11,000 | 23 | 236 | −49.4 | ---- | 23 | 230 | −51.5 | ---- | 28 | 240 | −47.6 | ---- | 26 | 224 | −55.4 | ---- | 25 | 232 | −50.8 | ---- | 25 | 226 | −53.0 | ---- | 25 | 242 | −46.4 | ---- |
| 12,000 | 22 | 202 | −55.3 | ---- | 22 | 197 | −53.6 | ---- | 27 | 206 | −53.0 | ---- | 25 | 192 | −58.6 | ---- | 24 | 198 | −53.8 | ---- | 25 | 194 | −53.9 | ---- | 25 | 208 | −52.4 | ---- |
| 13,000 | 21 | 172 | −58.3 | ---- | 20 | 168 | −55.4 | ---- | 27 | 176 | −57.9 | ---- | 25 | 163 | −59.8 | ---- | 24 | 169 | −55.6 | ---- | 20 | 165 | −54.6 | ---- | 24 | 178 | −57.1 | ---- |
| 14,000 | 20 | 147 | −60.2 | ---- | 17 | 143 | −56.9 | ---- | 26 | 150 | −60.4 | ---- | 22 | 139 | −60.6 | ---- | 22 | 144 | −57.4 | ---- | 19 | 141 | −54.5 | ---- | 23 | 152 | −60.2 | ---- |
| 15,000 | 18 | 124 | −61.5 | ---- | 12 | 122 | −57.6 | ---- | 25 | 128 | −61.6 | ---- | 16 | 118 | −61.8 | ---- | 22 | 123 | −58.6 | ---- | 18 | 121 | −55.7 | ---- | 22 | 129 | −63.2 | ---- |
| 16,000 | 18 | 106 | −62.7 | ---- | ---- | ---- | ---- | ---- | 25 | 109 | −63.8 | ---- | 11 | 101 | −63.2 | ---- | 20 | 105 | −60.3 | ---- | 13 | 103 | −56.6 | ---- | 22 | 110 | −66.0 | ---- |
| 17,000 | 16 | 90 | −63.6 | ---- | ---- | ---- | ---- | ---- | 21 | 92 | −65.5 | ---- | ---- | ---- | ---- | ---- | 13 | 90 | −61.4 | ---- | 10 | 88 | −57.4 | ---- | 19 | 93 | −67.9 | ---- |
| 18,000 | 14 | 76 | −63.8 | ---- | ---- | ---- | ---- | ---- | 14 | 78 | −64.3 | ---- | ---- | ---- | ---- | ---- | 6 | 76 | −62.0 | ---- | ---- | ---- | ---- | ---- | 13 | 78 | −68.3 | ---- |
| 19,000 | 9 | 64 | −62.6 | ---- | ---- | ---- | ---- | ---- | 6 | 66 | −62.8 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 10 | 66 | −67.1 | ---- |
| 20,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 5 | 56 | −61.3 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 5 | 56 | −65.2 | ---- |

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

Stations with elevations in meters above sea level

| Altitude (meters) m. s. l. | San Diego, Calif.[1] (19 m.) | | | | Sault Ste. Marie, Mich. (221 m) | | | | Seattle, Wash.[1] (27 m.) | | | | Spokane, Wash. (598 m.) | | | | Washington, D. C. (25 m.) | | | | Anchorage, Alaska (42 m.) | | | | Barrow, Alaska (6 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 | 27 | 1,013 | 16.5 | 81 | 30 | 985 | 1.5 | 82 | 30 | 1,014 | 8.9 | 87 | 30 | 948 | 3.6 | 88 | 30 | 1,016 | 9.0 | 64 | 30 | 999 | −6.2 | 73 | 30 | 1,014 | −19.6 | 91 |
| 500 | 27 | 957 | 16.7 | 60 | 30 | 952 | 0.0 | 82 | 30 | 958 | 7.8 | 75 | ---- | ---- | ---- | ---- | 30 | 960 | 9.5 | 55 | 29 | 943 | −6.0 | 68 | 30 | 950 | −15.3 | 88 |
| 1,000 | 27 | 902 | 14.5 | 48 | 30 | 894 | −2.4 | 82 | 30 | 902 | 5.3 | 72 | 30 | 902 | 4.8 | 78 | 30 | 904 | 6.8 | 53 | 29 | 884 | −7.1 | 65 | 30 | 889 | −15.6 | 83 |
| 1,500 | 27 | 850 | 11.9 | 41 | 30 | 839 | −4.2 | 82 | 30 | 848 | 2.6 | 72 | 30 | 848 | 2.7 | 71 | 30 | 850 | 4.8 | 50 | 29 | 829 | −9.1 | 63 | 30 | 832 | −17.0 | 80 |
| 2,000 | 27 | 801 | 9.4 | 35 | 30 | 788 | −4.9 | 72 | 30 | 797 | 0.1 | 65 | 30 | 797 | 0.2 | 67 | 30 | 799 | 2.8 | 49 | 29 | 777 | −11.6 | 60 | 30 | 778 | −19.2 | 78 |
| 2,500 | 27 | 753 | 6.7 | 31 | 30 | 739 | −6.5 | 69 | 30 | 748 | −2.2 | 60 | 29 | 749 | −2.4 | 65 | 30 | 751 | 0.9 | 48 | 29 | 727 | −14.2 | 57 | 30 | 727 | −21.8 | 77 |
| 3,000 | 27 | 708 | 3.7 | 27 | 30 | 692 | −9.1 | 68 | 30 | 702 | −4.7 | 58 | 29 | 703 | −5.0 | 62 | 30 | 705 | −1.3 | 45 | 29 | 681 | −17.3 | 55 | 30 | 679 | −24.1 | 75 |
| 4,000 | 27 | 626 | −1.7 | 26 | 30 | 608 | −14.6 | 68 | 30 | 618 | −10.8 | 59 | 29 | 618 | −10.7 | 55 | 30 | 621 | −6.7 | 41 | 29 | 595 | −23.9 | 53 | 30 | 591 | −29.6 | 72 |
| 5,000 | 27 | 551 | −7.6 | 26 | 29 | 532 | −20.8 | 66 | 30 | 542 | −17.4 | 64 | 28 | 542 | −17.4 | 54 | 29 | 546 | −12.2 | 37 | 27 | 518 | −30.3 | 52 | 30 | 513 | −35.9 | 70 |
| 6,000 | 26 | 484 | −14.2 | 34 | 27 | 464 | −27.4 | 64 | 30 | 473 | −24.3 | 64 | 27 | 474 | −24.5 | 54 | 27 | 478 | −18.9 | 35 | 27 | 449 | −36.9 | 50 | 30 | 444 | −42.5 | ---- |
| 7,000 | 25 | 424 | −21.4 | 37 | 26 | 403 | −34.1 | 60 | 30 | 412 | −31.4 | 66 | 27 | 412 | −31.5 | 56 | 25 | 418 | −25.8 | 35 | 27 | 388 | −42.9 | ---- | 30 | 382 | −48.6 | ---- |
| 8,000 | 21 | 369 | −28.8 | ---- | 26 | 349 | −40.9 | ---- | 29 | 357 | −38.5 | 68 | 27 | 357 | −38.6 | 56 | 24 | 363 | −32.8 | 34 | 26 | 334 | −47.9 | ---- | 30 | 327 | −53.3 | ---- |
| 9,000 | 21 | 320 | −35.9 | ---- | 25 | 300 | −45.2 | ---- | 28 | 308 | −45.3 | ---- | 27 | 308 | −45.9 | ---- | 23 | 314 | −39.6 | 34 | 25 | 287 | −51.5 | ---- | 29 | 280 | −55.6 | ---- |
| 10,000 | 20 | 277 | −42.7 | ---- | 25 | 258 | −49.6 | ---- | 27 | 265 | −50.9 | ---- | 24 | 264 | −51.8 | ---- | 23 | 271 | −46.0 | ---- | 25 | 246 | −52.9 | ---- | 29 | 239 | −54.9 | ---- |
| 11,000 | 17 | 238 | −48.9 | ---- | 25 | 222 | −52.4 | ---- | 26 | 227 | −55.1 | ---- | 23 | 227 | −54.6 | ---- | 23 | 233 | −51.7 | ---- | 24 | 210 | −52.6 | ---- | 27 | 205 | −53.3 | ---- |
| 12,000 | 15 | 204 | −54.8 | ---- | 20 | 190 | −53.0 | ---- | 25 | 194 | −56.3 | ---- | 22 | 194 | −55.4 | ---- | 23 | 199 | −56.6 | ---- | 23 | 180 | −51.4 | ---- | 27 | 175 | −52.1 | ---- |
| 13,000 | 14 | 175 | −58.7 | ---- | 20 | 162 | −53.3 | ---- | 23 | 166 | −56.7 | ---- | 18 | 166 | −56.0 | ---- | 22 | 170 | −59.6 | ---- | 20 | 154 | −50.8 | ---- | 25 | 150 | −51.7 | ---- |
| 14,000 | 12 | 149 | −61.8 | ---- | 15 | 138 | −54.3 | ---- | 21 | 142 | −57.8 | ---- | 18 | 141 | −57.8 | ---- | 19 | 144 | −61.2 | ---- | 15 | 132 | −50.3 | ---- | 21 | 128 | −51.7 | ---- |
| 15,000 | 8 | 126 | −65.3 | ---- | 11 | 118 | −54.4 | ---- | 18 | 121 | −59.3 | ---- | 17 | 120 | −58.6 | ---- | 19 | 122 | −62.6 | ---- | 13 | 113 | −49.9 | ---- | 15 | 110 | −51.5 | ---- |
| 16,000 | 7 | 107 | −68.6 | ---- | 10 | 101 | −55.2 | ---- | 14 | 103 | −59.8 | ---- | 14 | 103 | −58.9 | ---- | 17 | 104 | −64.1 | ---- | 7 | 97 | −49.9 | ---- | 10 | 94 | −51.9 | ---- |
| 17,000 | ---- | ---- | ---- | ---- | 7 | 86 | −55.3 | ---- | 7 | 87 | −60.0 | ---- | 6 | 88 | −59.4 | ---- | 15 | 88 | −64.9 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 18,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 6 | 75 | −65.1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |

Stations with elevations in meters above sea level

| Altitude (meters) m. s. l. | Bethel, Alaska (7 m.) | | | | Coco Solo, C. Z.[1 2] (15 m.) | | | | Fairbanks, Alaska (156 m.) | | | | Juneau, Alaska (49 m.) | | | | Ketchikan, Alaska (26 m.) | | | | Nome, Alaska (14 m.) | | | | San Juan, P. R. (15 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 | 24 | 1,009 | −9.1 | 77 | 19 | 1,012 | 26.3 | 89 | 30 | 992 | −15.8 | 81 | 29 | 1,000 | 2.0 | 76 | 28 | 1,004 | 5.5 | 83 | 30 | 1,009 | −7.2 | 79 | 30 | 1,012 | 24.8 | 89 |
| 500 | 24 | 948 | −6.4 | 71 | 19 | 957 | 24.4 | 87 | 30 | 949 | −14.2 | 83 | 29 | 946 | −0.8 | 76 | 28 | 948 | 3.3 | 84 | 30 | 948 | −7.5 | 80 | 30 | 958 | 22.4 | 89 |
| 1,000 | 24 | 889 | −8.2 | 66 | 19 | 903 | 21.2 | 87 | 30 | 888 | −14.2 | 80 | 28 | 888 | −3.8 | 79 | 28 | 891 | 0.2 | 84 | 30 | 889 | −10.2 | 77 | 30 | 905 | 19.5 | 86 |
| 1,500 | 24 | 833 | −10.1 | 62 | 19 | 853 | 18.1 | 76 | 30 | 831 | −14.8 | 78 | 27 | 833 | −6.2 | 80 | 27 | 837 | −2.7 | 82 | 30 | 832 | −12.2 | 72 | 30 | 854 | 16.7 | 85 |
| 2,000 | 24 | 780 | −12.0 | 55 | 19 | 804 | 15.3 | 73 | 30 | 778 | −16.2 | 77 | 27 | 781 | −8.2 | 80 | 27 | 786 | −5.3 | 79 | 30 | 780 | −13.7 | 66 | 30 | 805 | 14.3 | 83 |
| 2,500 | 24 | 731 | −13.7 | 48 | 19 | 758 | 12.8 | 63 | 30 | 728 | −18.0 | 73 | 27 | 732 | −11.0 | 79 | 27 | 737 | −7.9 | 73 | 30 | 730 | −16.1 | 62 | 30 | 758 | 12.2 | 73 |
| 3,000 | 24 | 684 | −16.4 | 45 | 19 | 713 | 10.1 | 50 | 30 | 680 | −20.4 | 69 | 27 | 686 | −13.7 | 75 | 27 | 690 | −10.6 | 68 | 30 | 683 | −18.6 | 59 | 30 | 714 | 10.0 | 64 |
| 4,000 | 24 | 598 | −22.4 | 43 | 10 | 632 | 3.7 | 38 | 29 | 594 | −26.0 | 65 | 24 | 600 | −19.6 | 63 | 25 | 605 | −16.7 | 62 | 27 | 596 | −24.3 | 55 | 30 | 633 | 4.5 | 60 |
| 5,000 | 24 | 521 | −28.3 | 41 | ---- | ---- | ---- | ---- | 28 | 516 | −32.0 | 63 | 23 | 523 | −25.7 | 59 | 21 | 529 | −23.4 | 59 | 26 | 520 | −30.2 | 54 | 29 | 559 | −1.1 | 55 |
| 6,000 | 24 | 452 | −34.8 | 42 | ---- | ---- | ---- | ---- | 28 | 448 | −38.3 | 61 | 20 | 454 | −31.9 | 55 | 20 | 460 | −29.6 | 57 | 22 | 451 | −36.7 | 53 | 29 | 493 | −7.0 | 53 |
| 7,000 | 23 | 391 | −40.9 | 42 | ---- | ---- | ---- | ---- | 27 | 386 | −44.6 | ---- | 19 | 393 | −38.9 | 52 | 18 | 399 | −36.2 | 57 | 21 | 386 | −42.9 | ---- | 29 | 433 | −13.5 | 45 |
| 8,000 | 22 | 337 | −46.9 | ---- | ---- | ---- | ---- | ---- | 24 | 332 | −49.6 | ---- | 16 | 338 | −45.3 | ---- | 16 | 344 | −43.0 | ---- | 17 | 336 | −48.3 | ---- | 29 | 379 | −20.4 | 44 |
| 9,000 | 22 | 289 | −51.5 | ---- | ---- | ---- | ---- | ---- | 22 | 285 | −52.6 | ---- | 12 | 290 | −50.1 | ---- | 16 | 296 | −48.7 | ---- | 17 | 288 | −51.8 | ---- | 29 | 330 | −27.6 | 40 |
| 10,000 | 22 | 248 | −53.2 | ---- | ---- | ---- | ---- | ---- | 20 | 244 | −53.8 | ---- | 12 | 248 | −53.3 | ---- | 14 | 254 | −51.7 | ---- | 13 | 248 | −53.1 | ---- | 28 | 287 | −34.6 | 38 |
| 11,000 | 22 | 212 | −53.7 | ---- | ---- | ---- | ---- | ---- | 18 | 209 | −52.9 | ---- | 11 | 212 | −54.3 | ---- | 12 | 218 | −52.1 | ---- | 13 | 212 | −53.8 | ---- | 28 | 248 | −41.7 | ---- |
| 12,000 | 20 | 182 | −52.2 | ---- | ---- | ---- | ---- | ---- | 17 | 179 | −51.5 | ---- | 11 | 181 | −53.1 | ---- | 11 | 186 | −50.7 | ---- | 12 | 182 | −52.8 | ---- | 25 | 214 | −48.7 | ---- |
| 13,000 | 18 | 156 | −50.5 | ---- | ---- | ---- | ---- | ---- | 16 | 154 | −50.6 | ---- | 8 | 155 | −52.5 | ---- | 11 | 159 | −50.6 | ---- | 11 | 156 | −51.3 | ---- | 25 | 183 | −56.0 | ---- |
| 14,000 | 17 | 134 | −49.5 | ---- | ---- | ---- | ---- | ---- | 11 | 132 | −50.2 | ---- | 8 | 133 | −52.3 | ---- | 9 | 136 | −50.8 | ---- | 9 | 134 | −50.5 | ---- | 25 | 156 | −63.4 | ---- |
| 15,000 | 12 | 114 | −48.9 | ---- | ---- | ---- | ---- | ---- | 6 | 114 | −50.0 | ---- | 5 | 113 | −52.0 | ---- | 7 | 116 | −51.3 | ---- | 9 | 116 | −49.5 | ---- | 24 | 132 | −69.9 | ---- |
| 16,000 | 5 | 98 | −49.1 | ---- | ---- | ---- | ---- | ---- | 5 | 97 | −49.6 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 7 | 100 | −49.1 | ---- | 23 | 112 | −74.8 | ---- |
| 17,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 6 | 86 | −49.6 | ---- | 22 | 94 | −78.2 | ---- |
| 18,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 20 | 78 | −77.8 | ---- |
| 19,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 19 | 66 | −74.6 | ---- |
| 20,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 16 | 56 | −69.8 | ---- |
| 21,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 7 | 47 | −65.0 | ---- |

NOTES FOR TABLE I

All observations taken at 11 p. m., 75th meridian time, except at Lakehurst, N. J., where they are taken near 5 a. m., at Norfolk, Va., at about 6 a. m., at Coco Solo, C. Z., at about 7 a. m., at St. Thomas, V. I., at about 8 a. m., and at Pearl Harbor, T. H., at about 7 a. m., E. S. T.

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°.

None of the means included in this table are based on less than 15 surface or 5 standard level observations.

[1] U. S. Navy.

[2] Airplane observations.

## LATE REPORTS

| Altitude (meters) m. s. l. | October 1941 | | | | | | | | | | | | September 1941 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Barrow, Alaska (6 m.) | | | | Pearl Harbor, T. H. (7 m.) | | | | Swan Island, W. I. (10m.) | | | | Barrow, Alaska (6m.) | | | |
| | 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 | 1,011 | −10.5 | 92 | 27 | 1,014 | 24.1 | 78 | 31 | 1,012 | 27.1 | 83 | 31 | 1,017 | 0.0 | 86 |
| 500 | 31 | 949 | −8.6 | 87 | 27 | 958 | 20.6 | 84 | 30 | 958 | 24.2 | 90 | 31 | 956 | 0.2 | 79 |
| 1,000 | 31 | 889 | −8.8 | 79 | 27 | 904 | 17.3 | 89 | 30 | 905 | 21.4 | 84 | 31 | 898 | −0.4 | 69 |
| 1,500 | 31 | 833 | −10.4 | 76 | 27 | 853 | 14.7 | 86 | 30 | 854 | 18.8 | 76 | 31 | 844 | −1.8 | 63 |
| 2,000 | 31 | 781 | −13.1 | 74 | 27 | 804 | 12.4 | 77 | 31 | 805 | 16.2 | 73 | 31 | 792 | −3.6 | 60 |
| 2,500 | 31 | 731 | −15.6 | 73 | 27 | 757 | 10.7 | 56 | 31 | 759 | 13.7 | 70 | 31 | 743 | −5.8 | 56 |
| 3,000 | 31 | 684 | −18.2 | 72 | 27 | 713 | 9.0 | 41 | 31 | 715 | 11.2 | 65 | 31 | 697 | −8.4 | 54 |
| 4,000 | 31 | 597 | −23.8 | 68 | 26 | 631 | 3.8 | 32 | 31 | 634 | 6.0 | 61 | 31 | 612 | −14.3 | 52 |
| 5,000 | 30 | 520 | −29.6 | 64 | 26 | 557 | −2.1 | 27 | 31 | 561 | 1.0 | 56 | 30 | 536 | −20.9 | 50 |
| 6,000 | 29 | 451 | −36.4 | 61 | 25 | 490 | −8.8 | 28 | 30 | 494 | −4.5 | 52 | 30 | 467 | −28.0 | 49 |
| 7,000 | 28 | 389 | −43.4 | | 24 | 430 | −15.0 | 39 | 30 | 435 | −10.3 | 51 | 29 | 405 | −35.2 | 49 |
| 8,000 | 28 | 334 | −49.5 | | 24 | 376 | −21.8 | 42 | 30 | 381 | −16.6 | 47 | 29 | 350 | −42.4 | |
| 9,000 | 28 | 287 | −53.9 | | 24 | 327 | −29.0 | 43 | 30 | 333 | −23.5 | 45 | 29 | 301 | −49.0 | |
| 10,000 | 28 | 245 | −53.5 | | 24 | 285 | −37.0 | | 30 | 290 | −30.7 | 44 | 29 | 258 | −53.6 | |
| 11,000 | 28 | 210 | −51.0 | | 22 | 246 | −45.3 | | 30 | 251 | −38.4 | 43 | 29 | 222 | −53.1 | |
| 12,000 | 28 | 180 | −50.3 | | 21 | 211 | −54.0 | | 30 | 217 | −46.4 | | 29 | 190 | −51.0 | |
| 13,000 | 27 | 154 | −50.3 | | 19 | 180 | −61.9 | | 26 | 186 | −54.4 | | 29 | 162 | −49.7 | |
| 14,000 | 27 | 132 | −50.5 | | 17 | 153 | −68.8 | | 24 | 159 | −62.3 | | 29 | 139 | −49.5 | |
| 15,000 | 24 | 114 | −50.6 | | 13 | 129 | −74.4 | | 23 | 135 | −70.0 | | 29 | 119 | −49.5 | |
| 16,000 | 19 | 97 | −51.4 | | 10 | 109 | −79.1 | | 23 | 114 | −76.8 | | 28 | 102 | −49.5 | |
| 17,000 | 15 | 84 | −52.1 | | 8 | 91 | −79.2 | | 20 | 95 | −81.2 | | 23 | 88 | −49.8 | |
| 18,000 | 6 | 72 | −52.7 | | 6 | 76 | −78.1 | | 18 | 80 | −82.8 | | 15 | 75 | −50.1 | |
| 19,000 | | | | | | | | | 11 | 67 | −78.7 | | 5 | 65 | −50.6 | |
| 20,000 | | | | | | | | | 6 | 56 | −72.9 | | | | | |

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during November 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.) | | | 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 | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity | Observations | Direction | Velocity |
| Surface | 30 | 228 | 2.2 | 29 | 215 | 0.9 | 28 | 318 | 0.9 | 28 | 256 | 3.8 | 29 | 297 | 3.6 | 30 | 319 | 0.6 | 29 | 70 | 2.9 | 27 | 242 | 6.3 | 28 | 208 | 1.6 | 30 | 9 | 0.5 | 28 | 248 | 3.8 | 30 | 231 | 2.2 | 29 | 266 | 1.1 |
| 500 | | | | | | | 28 | 326 | 1.2 | | | | | | | | | | 29 | 75 | 3.3 | 27 | 245 | 9.9 | 28 | 229 | 5.9 | 30 | 1 | 0.8 | 28 | 242 | 6.6 | 30 | 232 | 5.2 | | | |
| 1,000 | 30 | 226 | 2.9 | | | | 28 | 282 | 0.9 | | | | 29 | 306 | 5.7 | 30 | 166 | 0.1 | 24 | 106 | 1.8 | 25 | 247 | 13.7 | 26 | 250 | 8.2 | 29 | 289 | 1.5 | 24 | 250 | 11.0 | 28 | 242 | 7.2 | | | |
| 1,500 | 29 | 237 | 4.7 | | | | 26 | 304 | 1.6 | 28 | 262 | 8.6 | 22 | 293 | 9.5 | 30 | 209 | 1.2 | 22 | 177 | 1.2 | 22 | 261 | 13.6 | 22 | 266 | 9.9 | 27 | 272 | 3.1 | 21 | 260 | 12.1 | 26 | 256 | 9.4 | | | |
| 2,000 | 29 | 253 | 5.8 | 29 | 241 | 1.7 | 24 | 284 | 3.1 | 28 | 282 | 9.3 | 19 | 292 | 10.5 | 30 | 254 | 3.4 | 19 | 238 | 2.2 | 19 | 265 | 15.5 | 15 | 276 | 12.0 | 27 | 265 | 5.1 | 18 | 264 | 13.4 | 23 | 261 | 10.1 | 29 | 296 | 2.1 |
| 2,500 | 25 | 277 | 7.0 | 29 | 285 | 3.2 | 24 | 283 | 5.2 | 27 | 284 | 9.6 | 19 | 293 | 12.9 | 26 | 268 | 5.5 | 17 | 267 | 3.1 | 15 | 269 | 15.9 | | | | 24 | 257 | 7.4 | 16 | 271 | 15.1 | 19 | 274 | 11.7 | 29 | 301 | 3.1 |
| 3,000 | 25 | 277 | 7.8 | 29 | 299 | 5.3 | 24 | 276 | 7.0 | 26 | 285 | 12.5 | 18 | 289 | 15.1 | 24 | 275 | 7.8 | 14 | 283 | 5.0 | 11 | 272 | 18.9 | | | | 24 | 258 | 9.2 | 16 | 270 | 16.0 | 18 | 278 | 12.0 | 28 | 296 | 5.7 |
| 4,000 | 24 | 281 | 9.8 | 28 | 300 | 8.8 | 22 | 270 | 9.3 | 24 | 295 | 13.3 | 17 | 292 | 19.0 | 21 | 271 | 9.9 | 13 | 286 | 8.3 | | | | | | | 22 | 248 | 12.2 | 13 | 271 | 15.2 | 14 | 280 | 14.3 | 27 | 310 | 8.9 |
| 5,000 | 23 | 285 | 11.9 | 27 | 298 | 10.9 | 20 | 280 | 12.0 | 18 | 297 | 15.3 | 17 | 293 | 19.8 | 18 | 269 | 10.9 | 11 | 249 | 8.9 | | | | | | | 16 | 251 | 13.4 | 13 | 275 | 17.8 | | | | 27 | 308 | 9.8 |
| 6,000 | 23 | 285 | 14.9 | 25 | 298 | 11.5 | 18 | 274 | 14.1 | | | | 15 | 292 | 21.6 | 15 | 278 | 12.0 | 10 | 289 | 11.6 | | | | | | | 15 | 249 | 16.0 | 13 | 281 | 19.3 | | | | 24 | 312 | 12.0 |
| 8,000 | 16 | 287 | 21.9 | 22 | 289 | 15.3 | 15 | 279 | 13.4 | | | | 13 | 305 | 23.7 | | | | | | | | | | | | | | | | 12 | 282 | 23.7 | | | | 22 | 304 | 14.3 |
| 10,000 | 11 | 298 | 25.0 | 18 | 289 | 19.7 | 10 | 277 | 13.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 16 | 310 | 19.4 |
| 12,000 | 10 | 285 | 21.2 | 11 | 295 | 18.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 11 | 297 | 20.2 |

| 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 | 315 | 1.2 | 29 | 305 | 0.4 | 30 | 280 | 1.0 | 29 | 230 | 1.9 | 28 | 260 | 3.1 | 28 | 16 | 2.1 | 30 | 30 | 1.1 | 29 | 216 | 0.9 | 27 | 176 | 0.3 | 29 | 56 | 2.4 | 29 | 278 | 2.1 | 30 | 35 | 0.8 | 28 | 242 | 0.8 |
| 500 | | | | | | | | | | 29 | 234 | 3.1 | | | | 28 | 32 | 1.5 | | | | 29 | 219 | 2.0 | 27 | 169 | 0.4 | 29 | 71 | 3.9 | 29 | 273 | 3.5 | 30 | 27 | 2.0 | 28 | 220 | 1.9 |
| 1,000 | | | | | | | | | | 29 | 245 | 4.1 | 28 | 255 | 7.7 | 28 | 300 | 0.7 | 30 | 19 | 2.7 | 27 | 237 | 3.4 | 27 | 144 | 2.0 | 29 | 70 | 2.5 | 26 | 272 | 6.3 | 29 | 19 | 1.7 | 27 | 242 | 3.4 |
| 1,500 | 30 | 287 | 1.6 | | | | | | | 29 | 261 | 4.6 | 28 | 268 | 12.5 | 28 | 257 | 2.7 | 30 | 24 | 2.5 | 26 | 266 | 5.3 | 27 | 192 | 2.7 | 25 | 203 | 0.3 | 23 | 275 | 10.5 | 28 | 311 | 1.7 | 25 | 241 | 4.8 |
| 2,000 | 30 | 259 | 1.9 | 29 | 270 | 0.4 | 30 | 284 | 1.4 | 29 | 270 | 6.5 | 28 | 276 | 12.8 | 25 | 263 | 5.4 | 30 | 339 | 1.0 | 26 | 273 | 6.2 | 25 | 213 | 3.9 | 21 | 229 | 2.5 | 18 | 275 | 13.6 | 26 | 276 | 5.2 | 23 | 262 | 6.1 |
| 2,500 | 29 | 270 | 3.8 | 29 | 254 | 1.0 | 30 | 253 | 1.9 | 27 | 266 | 7.5 | 26 | 279 | 12.8 | 25 | 263 | 7.0 | 30 | 316 | 1.4 | 23 | 274 | 6.2 | 23 | 233 | 4.2 | 17 | 224 | 4.8 | 17 | 277 | 14.3 | 24 | 272 | 5.7 | 21 | 263 | 6.5 |
| 3,000 | 27 | 283 | 5.9 | 29 | 252 | 1.3 | 30 | 267 | 3.3 | 27 | 263 | 10.0 | 20 | 283 | 13.4 | 24 | 250 | 8.5 | 30 | 305 | 2.5 | 23 | 271 | 7.5 | 22 | 250 | 4.5 | 17 | 236 | 4.7 | 16 | 280 | 15.8 | 21 | 272 | 6.4 | 21 | 264 | 7.5 |
| 4,000 | 26 | 284 | 7.4 | 25 | 276 | 4.2 | 29 | 308 | 5.6 | 25 | 261 | 11.8 | 13 | 296 | 13.5 | 22 | 255 | 11.4 | 29 | 293 | 4.2 | 17 | 270 | 6.8 | 21 | 278 | 5.9 | 13 | 244 | 6.1 | 16 | 283 | 19.3 | 18 | 272 | 8.5 | 17 | 272 | 11.4 |
| 5,000 | 24 | 282 | 9.8 | 24 | 288 | 7.3 | 25 | 326 | 9.6 | 25 | 259 | 15.2 | 12 | 292 | 14.3 | 19 | 258 | 11.9 | 28 | 302 | 6.2 | 15 | 295 | 7.7 | 20 | 281 | 7.4 | 14 | 244 | 6.9 | 14 | 286 | 24.3 | 14 | 274 | 11.1 | 13 | 272 | 13.2 |
| 6,000 | 23 | 285 | 10.8 | 23 | 303 | 9.1 | 20 | 320 | 10.6 | 23 | 265 | 18.3 | | | | 20 | 260 | 14.5 | 28 | 301 | 9.1 | 13 | 296 | 7.3 | 18 | 301 | 11.4 | 14 | 247 | 9.0 | 10 | 288 | 28.4 | | | | 12 | 277 | 15.7 |
| 8,000 | 21 | 296 | 16.1 | 21 | 299 | 12.4 | | | | 19 | 272 | 20.8 | | | | 14 | 261 | 19.7 | 24 | 296 | 12.7 | | | | 14 | 316 | 16.3 | 12 | 267 | 14.3 | | | | | | | | | |
| 10,000 | 21 | 289 | 19.3 | 19 | 321 | 11.8 | | | | 15 | 274 | 23.4 | | | | | | | 23 | 294 | 18.8 | | | | 12 | 305 | 19.0 | | | | | | | | | | | | |
| 12,000 | 17 | 308 | 20.8 | | | | | | | 10 | 276 | 25.4 | | | | | | | 19 | 302 | 21.3 | | | | | | | | | | | | | | | | | | |
| 14,000 | 14 | 306 | 19.2 | | | | | | | | | | | | | | | | 16 | 302 | 20.7 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 15 | 290 | 15.7 | | | | | | | | | | | | | | | | | | |

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during November 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. | 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. (12 m.) | | | 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 | 28 | 271 | 4.0 | 27 | 253 | 1.7 | 29 | 227 | 2.5 | 27 | 231 | 2.6 | 30 | 159 | 0.4 | 30 | 339 | 3.9 | 27 | 242 | 2.9 | 30 | 82 | 1.3 | 30 | 295 | 2.8 | 22 | 300 | 1.7 | 24 | 206 | 1.3 | 27 | 196 | 1.2 | 30 | 252 | 2.3 |
| 500 | 28 | 268 | 7.2 | 27 | 291 | 0.9 | 29 | 231 | 2.9 | 27 | 232 | 3.4 | 30 | 118 | 0.4 | | | | 27 | 247 | 4.9 | 30 | 107 | 1.1 | 30 | 290 | 2.4 | 22 | 276 | 2.5 | 24 | 190 | 3.4 | | | | 30 | 254 | 3.9 |
| 1,000 | 28 | 271 | 9.0 | 20 | 76 | 0.2 | 29 | 232 | 4.2 | 27 | 265 | 6.9 | 30 | 80 | 0.8 | 30 | 337 | 4.0 | 25 | 253 | 6.6 | 29 | 151 | 0.6 | 29 | 70 | 0.2 | 19 | 272 | 4.9 | 24 | 194 | 6.1 | 27 | 207 | 3.2 | 29 | 263 | 4.8 |
| 1,500 | 25 | 279 | 10.4 | 20 | 163 | 1.0 | 27 | 267 | 6.3 | 25 | 277 | 8.4 | 30 | 117 | 1.0 | 30 | 314 | 5.9 | 22 | 257 | 8.4 | 29 | 255 | 2.0 | 29 | 69 | 1.2 | 13 | 272 | 7.9 | 24 | 206 | 7.6 | 24 | 225 | 5.7 | 29 | 273 | 7.4 |
| 2,000 | 18 | 271 | 10.9 | 19 | 266 | 0.9 | 24 | 278 | 7.6 | 19 | 262 | 10.7 | 30 | 128 | 0.9 | 29 | 301 | 9.0 | 19 | 260 | 10.5 | 27 | 266 | 4.4 | 28 | 14 | 1.4 | | | | 19 | 206 | 7.5 | 23 | 241 | 6.4 | 29 | 279 | 10.0 |
| 2,500 | 15 | 270 | 12.4 | 18 | 341 | 1.5 | 24 | 278 | 7.8 | 19 | 269 | 10.7 | 30 | 199 | 0.2 | 27 | 304 | 10.6 | 18 | 268 | 10.4 | 26 | 270 | 6.1 | 28 | 335 | 1.9 | | | | 19 | 221 | 7.7 | 21 | 254 | 7.6 | 23 | 281 | 11.6 |
| 3,000 | 12 | 264 | 11.3 | 17 | 353 | 2.5 | 23 | 267 | 8.4 | 19 | 271 | 11.2 | 30 | 271 | 0.9 | 26 | 304 | 12.3 | 18 | 269 | 12.0 | 25 | 275 | 8.2 | 27 | 325 | 3.1 | | | | 16 | 234 | 7.1 | 18 | 269 | 9.7 | 22 | 279 | 12.8 |
| 4,000 | | | | 17 | 327 | 4.3 | 20 | 270 | 10.1 | 19 | 273 | 12.9 | 28 | 284 | 3.3 | 23 | 306 | 13.6 | 17 | 272 | 13.6 | 22 | 279 | 9.8 | 21 | 300 | 6.3 | | | | 13 | 258 | 9.4 | 14 | 284 | 9.3 | 20 | 268 | 14.6 |
| 5,000 | | | | 15 | 338 | 6.0 | 19 | 268 | 12.5 | 17 | 278 | 14.4 | 26 | 294 | 6.7 | 21 | 304 | 15.0 | 16 | 280 | 15.6 | 19 | 265 | 11.4 | 17 | 299 | 8.1 | | | | 11 | 275 | 12.7 | 14 | 290 | 11.4 | 16 | 270 | 18.3 |
| 6,000 | | | | 15 | 328 | 8.1 | 16 | 284 | 13.4 | 15 | 282 | 15.2 | 24 | 282 | 10.1 | 19 | 308 | 16.3 | 13 | 284 | 16.0 | 18 | 268 | 12.3 | 14 | 299 | 8.2 | | | | | | | 11 | 301 | 14.7 | 15 | 266 | 18.9 |
| 8,000 | | | | | | | 12 | 312 | 13.6 | 10 | 282 | 19.2 | 23 | 278 | 16.9 | 16 | 322 | 19.7 | | | | 14 | 288 | 17.0 | | | | | | | | | | | | | | | |
| 10,000 | | | | | | | | | | | | | 17 | 290 | 18.5 | 12 | 326 | 22.4 | | | | 13 | 273 | 18.7 | | | | | | | | | | | | | | | |
| 12,000 | | | | | | | | | | | | | 12 | 290 | 18.5 | | | | | | | | | | | | | | | | | | | | | | | | |

TABLE 3.—*Maximum free-air wind velocities, (m. p. s.), for different sections of the United States based on pilot-balloon observations during November 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] | 48.0 | WNW | 2,500 | 27 | Boston, Mass. | 61.0 | WNW | 2,980 | 27 | Boston, Mass. | 63.5 | W | 6,190 | 27 | Portland, Maine. |
| East-Central [2] | 36.1 | WSW | 2,500 | 1 | Knoxville, Tenn. | 49.0 | SW | 4,820 | 24 | Richmond, Va. | 85.0 | SSW | 7,650 | 8 | Greensboro, N. C. |
| Southeast [3] | 35.8 | WNW | 2,500 | 9 | Tallahassee, Fla. | 43.0 | SW | 4,150 | 8 | Jacksonville, Fla. | 58.0 | WNW | 11,900 | 16 | Miami, Fla. |
| North-Central [4] | 35.2 | WNW | 2,500 | 26 | Duluth, Minn. | 48.4 | WNW | 5,000 | 15 | Minneapolis, Minn. | 65.0 | WNW | 6,150 | 25 | Huron, S. Dak. |
| Central [5] | 38.1 | SW | 1,100 | 18 | Des Moines, Iowa | 49.6 | W | 4,770 | 20 | Springfield, Ill. | | | 12,890 | 12 | Minneapolis, Minn. |
| | | | | | | | | | | | 62.4 | W | 16,560 | 14 | Wichita, Kan. |
| South-Central [6] | 31.5 | SSW | 1,920 | 18 | Tulsa, Okla. | 43.2 | SW | 4,810 | 19 | Oklahoma City, Okla. | 76.8 | WSW | 8,860 | 23 | Abilene, Tex. |
| | | | | | | | NNW | 4,950 | 8 | Waco, Tex. | | | | | |
| Northwest [7] | 43.5 | W | 2,300 | 24 | Havre, Mont. | 55.0 | W | 3,300 | 24 | Great Falls, Mont. | 71.0 | N | 10,545 | 19 | Medford, Oreg. |
| West-Central [8] | 36.6 | W | 2,500 | 24 | Cheyenne, Wyo. | 44.4 | WSW | 3,330 | 16 | Reno, Nev. | 73.0 | WNW | 15,360 | 29 | Rock Springs, Wyo. |
| Southwest [9] | 31.8 | SW | 1,370 | 17 | Las Vegas, Nev. | 46.6 | WNW | 4,800 | 17 | Burbank, Calif. | 73.0 | W | 10,480 | 23 | El Paso, Tex. |

[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.

## WEATHER ON THE NORTH ATLANTIC OCEAN

By H. C. HUNTER

*Atmospheric pressure.*—During November 1941 the pressure over those areas of the North Atlantic which are well covered by available reports was in the main lower than normal. This was notably the case near the Azores, where the average pressure at Horta was 5.2 millibars (0.15 inch) less than the normal November mean, owing to almost continuously subnormal pressure during the first half of the month. There were less notable deficiencies near the coast of Portugal and the east coast of the United States. On the other hand, near southeastern Nova Scotia the average pressure exceeded the monthly normal.

The extremes of pressure in the vessel reports that have been received were 1,035.2 and 985.1 millibars (30.57 and 29.09 inches). The high mark was recorded at a very early hour of the 29th near 42° N., 65° W. The low mark was noted not far to southwestward of the westernmost Azores shortly before sunrise of the 2d. A pressure substantially the same as the low mark mentioned was noted at Horta on the 7th, as table 1 indicates.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, November 1941*

| Station | Average pressure | Departure from normal | Highest | Date | Lowest | Date |
|---|---|---|---|---|---|---|
| | *Millibars* | *Millibars* | *Millibars* | | *Millibars* | |
| Lisbon, Portugal [1] | 1,015.9 | −1.4 | 1,025 | 23–25 | 995 | 11 |
| Horta, Azores | 1,015.1 | −5.2 | 1,030 | 27 | 985 | 7 |
| Belle Isle, Newfoundland | 1,008.1 | .0 | 1,023 | 2 | 986 | 22 |
| Halifax, Nova Scotia | 1,016.6 | +2.4 | 1,032 | 29 | 999 | 21 |
| Nantucket | 1,016.9 | −.7 | 1,035 | 28 | 997 | 7 |
| Hatteras | 1,019.0 | −.6 | 1,032 | 28 | 1,001 | 6 |
| Turks Island | 1,015.0 | −.6 | 1,019 | 29 | 1,011 | 16, 21 |
| Key West | 1,016.3 | −.3 | 1,023 | 10 | 1,010 | 6 |
| New Orleans | 1,019.6 | +.3 | 1,031 | 24 | 1,008 | 5 |

[1] For 27 days.

NOTE.—All data based on available observations, departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

*Cyclones and gales.*—No storms worthy of special comment affected the lower latitudes this month, and in the middle latitudes, as far as reports that have come to hand indicate, the month was comparatively undisturbed for November, save for a few days near southwestern Europe. In the portion of the ocean west of longitude