

Resultant velocities exceeded the normals during May, July, and November.

An outstanding feature of the year was the inauguration of free-rising captive-balloon observations. This method has proved valuable when winds are too light for kite flying and contributes to the continuity of daily free-air soundings.

A limiting-height device (Rossby deflation valve) was also used occasionally and the balloon allowed to rise unrestricted by wire. The valve was set so as to deflate the balloon between 2 and 3 kilometers. The balloon's ascent and descent were then followed by means of two theodolites and its recovery effected usually within a very short time.

During October, the International Month for 1927, a series of 44 sounding-balloon observations were made at Groesbeck, Tex. Thus far 34 of the meteorographs have been returned. Practically all of the ascensions were observed with two theodolites to high altitudes which in some cases exceeded 20 kilometers. On October 14 and 15, designated as the International Days, continuous kite flights were made at the aerological stations and 5 airplane soundings at the Naval Air Station, Anacostia, D. C.

A series of sounding-balloon observations were made on December 30 and 31 when 12 Weather Bureau stations released 2 balloons each. Continuous kite flights were also made on the same days at the aerological stations, a series of airplane observations at several naval air stations and special pilot-balloon observations at most of the pilot-balloon stations. This program was carried out in connection with a special study of free-air convection.

During the year there were 1535 kite flights made, averaging 2,685 meters in altitude, 32 captive-balloon observations, nearly 30,000 pilot-balloon observations and 225 airplane observations, the latter at the Naval Air Station, Anacostia, D. C.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during the year 1927

| Altitude, m. s. l. (Mean) | TEMPERATURE (°C.)                |                              |                              |                              |                                 |                               |                              |                              |                                 |                               |                               |                              |
|---------------------------|----------------------------------|------------------------------|------------------------------|------------------------------|---------------------------------|-------------------------------|------------------------------|------------------------------|---------------------------------|-------------------------------|-------------------------------|------------------------------|
|                           | Broken Arrow, Okla. (233 meters) |                              | Due West, S. C. (217 meters) |                              | Ellendale, N. Dak. (444 meters) |                               | Groesbeck, Tex. (141 meters) |                              | Royal Center, Ind. (225 meters) |                               | Washington, D. C.* (7 meters) |                              |
|                           | Mean                             | De- parture from 9-year mean | Mean                         | De- parture from 7-year mean | Mean                            | De- parture from 10-year mean | Mean                         | De- parture from 9-year mean | Mean                            | De- parture from 10-year mean | Mean                          | De- parture from 8-year mean |
| Surface..                 | 15.5                             | -0.1                         | 16.9                         | -0.1                         | 4.0                             | -1.5                          | 18.9                         | +0.7                         | 10.8                            | -0.3                          | 13.6                          | .....                        |
| 250.....                  | 15.4                             | -0.1                         | 16.6                         | -0.1                         | .....                           | .....                         | 18.4                         | +0.8                         | 10.6                            | -0.3                          | 13.9                          | .....                        |
| 500.....                  | 14.4                             | +0.2                         | 15.0                         | +0.1                         | 3.9                             | -1.5                          | 17.4                         | +1.1                         | 9.0                             | +0.0                          | 12.5                          | .....                        |
| 750.....                  | 13.6                             | +0.4                         | 14.0                         | +0.4                         | 3.7                             | -1.2                          | 16.5                         | +1.1                         | 8.0                             | +0.2                          | 11.3                          | .....                        |
| 1,000.....                | 13.0                             | +0.6                         | 13.0                         | +0.5                         | 3.6                             | -1.0                          | 15.9                         | +1.2                         | 7.3                             | +0.5                          | 10.2                          | .....                        |
| 1,250.....                | 12.4                             | +0.8                         | 11.8                         | +0.5                         | 3.2                             | -0.9                          | 15.2                         | +1.3                         | 6.4                             | +0.6                          | 9.1                           | .....                        |
| 1,500.....                | 11.6                             | +1.0                         | 10.6                         | +0.5                         | 2.5                             | -0.8                          | 14.3                         | +1.3                         | 5.4                             | +0.6                          | 8.1                           | +1.9                         |
| 2,000.....                | 9.3                              | +0.9                         | 8.1                          | +0.4                         | 0.3                             | -0.9                          | 12.2                         | +1.3                         | 3.1                             | +0.4                          | 6.0                           | +2.0                         |
| 2,500.....                | 6.7                              | +0.9                         | 5.7                          | +0.5                         | -2.3                            | -0.9                          | 9.8                          | +1.3                         | 0.8                             | +0.5                          | 3.7                           | +2.0                         |
| 3,000.....                | 3.8                              | +0.8                         | 3.5                          | +0.8                         | -5.2                            | -1.0                          | 7.1                          | +1.1                         | -1.6                            | +0.6                          | 1.1                           | +2.1                         |
| 3,500.....                | 1.1                              | +0.9                         | 1.2                          | +1.2                         | -7.9                            | -0.9                          | 4.6                          | +1.3                         | -4.2                            | +0.6                          | -1.1                          | +2.9                         |
| 4,000.....                | -2.0                             | +0.7                         | -1.2                         | +1.6                         | -10.8                           | -1.0                          | 1.6                          | +1.1                         | -6.8                            | +0.6                          | -3.6                          | +3.4                         |
| 4,500.....                | -5.3                             | +0.2                         | -3.0                         | +2.6                         | -13.8                           | -1.1                          | -1.6                         | +0.6                         | -9.7                            | +0.4                          | -4.6                          | +5.6                         |
| 5,000.....                | -8.1                             | +0.2                         | -4.4                         | +4.0                         | -16.5                           | -1.0                          | .....                        | .....                        | -12.9                           | +0.4                          | -8.4                          | +4.9                         |

  

| RELATIVE HUMIDITY (%) |    |    |    |     |       |       |       |       |    |    |    |       |
|-----------------------|----|----|----|-----|-------|-------|-------|-------|----|----|----|-------|
| Surface..             | 70 | +2 | 68 | +2  | 75    | +3    | 78    | +1    | 72 | +2 | 63 | ..... |
| 250.....              | 70 | +2 | 68 | +2  | ..... | ..... | 75    | +2    | 72 | +2 | 64 | ..... |
| 500.....              | 65 | 0  | 67 | +1  | 74    | +3    | 74    | +3    | 71 | +2 | 63 | ..... |
| 750.....              | 61 | -2 | 65 | -1  | 69    | +2    | 72    | +4    | 69 | +1 | 61 | ..... |
| 1,000.....            | 59 | -2 | 65 | -1  | 65    | +1    | 67    | +3    | 65 | -1 | 60 | ..... |
| 1,250.....            | 56 | -2 | 66 | 0   | 63    | +2    | 62    | +2    | 62 | -2 | 58 | ..... |
| 1,500.....            | 53 | -3 | 66 | +1  | 61    | +2    | 57    | 0     | 60 | -2 | 53 | ..... |
| 2,000.....            | 48 | -4 | 63 | +1  | 61    | +4    | 50    | -1    | 56 | -2 | 54 | ..... |
| 2,500.....            | 46 | -4 | 57 | -1  | 62    | +6    | 46    | -2    | 51 | -3 | 49 | ..... |
| 3,000.....            | 46 | -3 | 54 | -1  | 62    | +7    | 44    | -1    | 61 | -1 | 47 | ..... |
| 3,500.....            | 45 | -3 | 52 | -1  | 60    | +6    | 43    | 0     | 48 | -2 | 44 | ..... |
| 4,000.....            | 45 | -2 | 47 | -5  | 57    | +4    | 47    | +5    | 44 | -4 | 39 | ..... |
| 4,500.....            | 51 | +6 | 52 | 0   | 56    | +3    | 50    | +10   | 43 | -4 | 29 | ..... |
| 5,000.....            | 40 | -5 | 15 | -35 | 52    | +1    | ..... | ..... | 42 | -8 | 21 | ..... |

  

| VAPOR PRESSURE (mb.) |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Surface..            | 14.35 | +0.57 | 14.30 | +0.40 | 7.93  | -0.17 | 17.98 | +1.13 | 10.01 | -3.18 | 12.96 | ..... |
| 250.....             | 14.21 | +0.54 | 14.20 | +0.42 | ..... | ..... | 17.43 | +1.21 | 10.55 | -0.08 | 11.91 | ..... |
| 500.....             | 12.56 | +0.38 | 12.83 | +0.47 | 7.72  | -0.17 | 16.08 | +1.35 | 9.43  | +0.03 | 10.76 | ..... |
| 750.....             | 11.20 | +0.23 | 11.78 | +0.44 | 6.92  | -0.13 | 14.56 | +1.31 | 8.68  | +0.13 | 9.66  | ..... |
| 1,000.....           | 10.30 | +0.30 | 11.05 | +0.57 | 6.28  | -0.14 | 12.82 | +1.11 | 7.84  | +0.04 | 8.83  | ..... |
| 1,250.....           | 9.33  | +0.30 | 10.34 | +0.73 | 5.80  | -0.05 | 11.14 | +0.80 | 7.02  | -0.04 | 8.24  | ..... |
| 1,500.....           | 8.31  | +0.24 | 9.43  | +0.74 | 5.28  | -0.02 | 9.58  | +0.48 | 6.29  | +0.04 | 7.82  | ..... |
| 2,000.....           | 6.41  | +0.06 | 7.44  | +0.51 | 4.44  | +0.10 | 7.06  | +0.03 | 5.02  | +0.02 | 5.42  | ..... |
| 2,500.....           | 5.03  | +0.06 | 5.63  | +0.18 | 3.71  | +0.15 | 5.41  | -0.17 | 3.83  | +0.01 | 4.84  | ..... |
| 3,000.....           | 4.12  | +0.18 | 4.49  | +0.16 | 3.01  | +0.15 | 4.33  | -0.14 | 3.10  | +0.12 | 3.38  | ..... |
| 3,500.....           | 3.36  | +0.19 | 3.77  | +0.27 | 2.32  | +0.02 | 3.58  | -0.03 | 2.41  | +0.10 | 2.50  | ..... |
| 4,000.....           | 2.51  | +0.05 | 2.83  | -0.01 | 1.75  | -0.11 | 3.07  | +0.12 | 1.83  | +0.08 | 1.89  | ..... |
| 4,500.....           | 2.01  | +0.07 | 2.84  | +0.42 | 1.23  | -0.27 | 2.78  | +0.39 | 1.51  | +0.09 | 1.25  | ..... |
| 5,000.....           | 0.99  | -0.58 | ..... | ..... | 0.60  | -0.60 | ..... | ..... | 1.27  | +0.10 | 0.67  | ..... |

\* Naval air station, Anacostia, D. C.

THE WEATHER IN THE UNITED STATES

GENERAL CONDITIONS<sup>1</sup>

A cold month, particularly in the upper Missouri Valley and adjacent regions as shown by Chart III. Precipitation was on the whole more abundant than for the average December. See the inset on Chart IV. The usual details follow.

THE WEATHER ELEMENTS

By P. C. DAY

PRESSURE AND WINDS

The notable feature of the closing month of 1927 was the persistent and severe cold that prevailed over the northern districts from the Great Lakes westward during the greater part of the first two decades, and to a less extent even during the last. Anticyclones largely dominated the weather over the northwestern districts and few important cyclones entered the country from that section during the latter half of the month until near the end.

Moderately low pressure over the Atlantic Coast States during the first few days caused heavy precipitation from

the East Gulf States northeastward to New England, with some sleet and the only snow of the month in the Middle Atlantic States. At the same time light, soattered snows occurred over most northern districts from the Great Lakes westward.

By the morning of the 6th a moderate barometric depression was central over Colorado, and light precipitation, mostly snow, had occurred from the upper Missouri Valley westward to Oregon and Washington. During the following 24 hours this depression moved to southeastern Iowa and precipitation extended into the central valleys, with some heavy rain in eastern Texas and considerable snow from the upper Lakes westward to Montana. During the following day this storm advanced to the southeastward, increasing greatly in severity as it crossed the upper Lakes where it was one of the most severe experienced in many years. Precipitation, mostly rain, extended into all districts from the Mississippi River eastward, heavy amounts occurring in a few localities, and some snow falling in the upper Lake region.

With the passage of this cyclone no important storm occurred until about the 12th, when general rains set in over a wide area from the west Gulf region northeastward to the Great Lakes and North Atlantic States, ex-

<sup>1</sup>This paragraph will be discontinued with the issue for the current month.—Editor.