

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

The free-air temperatures were, in general, above normal at the northern stations and below normal at the southern stations. From Table 1 it will be seen that the greatest positive departures occurred at Ellendale and the greatest negative departures in the lower levels at Due West and at 1,000 m. and 1,250 m. above Groesbeck. This distribution is in general agreement with the surface departures shown in Chart I of this REVIEW.

Relative humidity departures were mostly small, the largest values occurring at Ellendale, where they were consistently below normal in accordance with the positive temperature departures, and at Broken Arrow, where they were all positive and likewise in accordance with the negative temperature departures there.

Departures of vapor pressure for the month were unusual at Broken Arrow and Ellendale in that they were of opposite sign from those for temperature. At the former station, where temperatures were below normal and vapor pressures above, it is interesting to observe that the total amount of precipitation for the month was 2.09 inches, the largest on record for February. Likewise, at Ellendale where supernormal free-air temperatures occurred and subnormal vapor pressures, the total precipitation for the month (0.23 inch) was the lowest for February with a single exception since the establishment of the station in 1917.

From Table 2 it will be seen that the resultant wind velocities for the month were close to their normals in most cases. The largest deviations from the resultant directions occurred at Due West and Groesbeck, where a northerly component prevailed instead of the normal southerly at a number of levels.

Pilot balloon observations revealed easterly winds at altitudes ranging from 3 km. to the Cirrus level from the 8th to 11th, inclusive, at a number of western stations, viz, Cheyenne, Salt Lake City, Sheridan, Modena, Boise, Reno, and San Francisco. Easterly winds at such high elevations are unusual during the winter season in these latitudes and indicate a general reversal of the horizontal pressure and temperature gradients at these heights. During this period a high-pressure area prevailed over the Pacific Ocean and impinged on the North Pacific Coast States. As a portion of this high became detached from the major section abnormally low surface temperatures were carried southeastward while relatively high temperatures prevailed to the northward, resulting in a reversal of the normal horizontal pressure gradient at these upper levels and the easterly winds observed.

An excellent example of cold underrunning air superimposed by an unusually pronounced temperature inversion is shown in the kite record of Groesbeck for the 23d. At the time a strong high-pressure area had just reached that region and surface temperatures were falling rapidly. The morning kite flight showed a surface temperature of 3.6° C., with a lapse rate of 0.78° per 100 m. to an altitude

of 600 m., where the temperature was -1.2° C. Through-out the next 500 m. layer the temperature rose 12.6°, i. e., to 11.4° C. At an altitude of 2,500 m. the temperature was still no lower than at the surface. Such abnormal vertical temperature gradients are rare in this latitude and occur only when strong anticyclones invade these regions.

TABLE 1.—Free-air temperatures, relative humidities and vapor pressures during February, 1928

TEMPERATURE (°C)

Altitude m. s. l.	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (226 meters)		Washington, D. C. (7 meters) ¹	
	Mean	De- parture from 10-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 11-yr. mean	Mean	De- parture from 10-yr. mean	Mean	De- parture from 10-yr. mean	Mean	De- parture from 3-yr. mean
Surface	5.1	-0.4	5.9	-2.6	-7.4	+1.8	8.8	-1.6	-1.0	+0.1	3.9	+0.5
250	5.1	-0.3	5.8	-2.5	-7.5	+1.8	8.1	-1.9	-1.2	+0.1	2.1	-0.1
500	4.0	-0.3	5.4	-1.8	-7.5	+1.8	7.0	-2.1	-2.8	+0.3	1.1	-0.4
750	3.1	-0.5	5.4	-1.0	-7.6	+1.3	6.1	-2.6	-3.6	+0.2	-0.2	-0.5
1,000	2.4	-1.0	5.0	-0.6	-7.5	+0.7	6.2	-2.3	-4.3	-0.2	-1.6	-0.6
1,250	1.7	-1.4	4.3	-0.4	-7.6	+0.1	6.2	-1.7	-5.0	-0.5	-2.9	-0.8
1,500	1.2	-1.2	3.6	-0.2	-7.8	-0.2	5.4	-1.7	-5.9	-0.9	-4.4	-1.5
2,000	-0.5	-1.3	2.1	+0.2	-9.2	-0.2	3.2	-1.8	-7.8	-1.4	-5.5	-1.6
2,500	-2.5	-1.0	-0.4	+0.1	-11.1	+0.2	1.2	-1.4	-9.5	-1.2	-7.6	-1.8
3,000	-5.1	-1.0	-2.5	+0.4	-13.5	+0.5	-1.5	-1.7	-11.8	-1.0	-9.7	-1.1
3,500	-7.3	-0.7	-----	-----	-16.4	+0.3	-3.7	-1.5	-14.4	-0.8	-----	-----
4,000	-10.1	-0.8	-----	-----	-----	-----	-5.2	-0.5	-----	-----	-----	-----
4,500	-13.0	-0.7	-----	-----	-----	-----	-8.4	-1.0	-----	-----	-----	-----
5,000	-15.7	-0.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

RELATIVE HUMIDITY (%)

Surface	70	+2	70	+2	75	-6	72	-1	76	-1	65	-5
250	70	+2	69	+1	-----	-----	71	0	76	-1	64	-4
500	68	+3	64	-1	67	-6	67	-1	76	-1	63	-2
750	65	+4	62	-1	74	-7	65	+1	75	+1	63	-2
1,000	63	+7	62	0	62	-7	59	0	69	0	66	0
1,250	62	+9	63	+2	65	-9	54	-1	65	+1	66	0
1,500	57	+6	58	-1	51	-9	52	+1	62	+1	68	+3
2,000	51	+4	58	-1	45	-12	48	+2	54	-2	60	+1
2,500	50	+4	57	+2	42	-15	48	+5	49	-5	52	-3
3,000	50	+5	45	-7	42	-14	44	+3	50	-5	78	+23
3,500	53	+9	-----	-----	42	-12	37	-2	51	-4	-----	-----
4,000	55	+11	-----	-----	-----	-----	35	-1	-----	-----	-----	-----
4,500	48	+6	-----	-----	-----	-----	35	+3	-----	-----	-----	-----
5,000	48	+6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

VAPOR PRESSURE (mb.)

Surface	6.70	+0.29	6.73	1.38	2.78	+0.10	8.50	-1.22	4.61	0.00	5.42	-0.16
250	6.66	+0.30	6.62	1.37	-----	-----	8.06	-1.23	4.54	0.00	4.76	-0.22
500	6.09	+0.48	5.95	1.19	2.70	+0.07	7.12	-1.25	4.10	+0.09	4.36	-0.18
750	5.56	+0.62	5.83	0.82	2.33	-0.13	6.53	-1.07	3.90	+0.25	4.02	-0.14
1,000	5.24	+0.77	5.67	0.56	2.13	-0.25	6.00	-0.77	3.37	+0.08	3.77	-0.07
1,250	4.81	+0.77	5.40	0.33	1.90	-0.39	5.37	-0.68	2.89	-0.02	3.41	-0.09
1,500	4.23	+0.62	4.77	0.39	1.72	-0.41	4.84	-0.42	2.57	-0.03	3.06	-0.11
2,000	3.25	+0.40	3.84	0.27	1.48	-0.30	3.77	-0.30	1.89	-0.18	2.36	-0.21
2,500	2.73	+0.39	3.15	0.12	1.24	-0.23	3.22	-0.05	1.67	-0.04	1.66	-0.35
3,000	2.14	+0.24	1.88	0.64	1.03	-0.12	2.30	-0.41	1.55	+0.16	2.26	+0.71
3,500	1.98	+0.39	-----	-----	0.90	+0.01	1.57	-0.64	1.47	+0.38	-----	-----
4,000	1.70	+0.38	-----	-----	-----	-----	1.42	-0.32	-----	-----	-----	-----
4,500	1.28	+0.23	-----	-----	-----	-----	1.30	+0.03	-----	-----	-----	-----
5,000	1.20	+0.39	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

¹ Naval air station, Anacostia, D. C.

TABLE 2.—Free-air resultant winds (m. p. s.) during February, 1928

Altitude m. s. l.	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Grosbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)			
	Mean		10-year mean		Mean		7-year mean		Mean		11-year mean		Mean		10-year mean		Mean		10-year mean		Mean		8-year mean	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
<i>Meters</i>	°																							
Surface	S. 77 W.	1.2	N. 53 W.	0.5	N. 53 E.	0.4	S. 82 W.	1.5	N. 53 W.	4.3	N. 47 W.	3.4	N. 18 W.	0.6	W.	0.6	S. 74 W.	2.4	S. 81 W.	2.0	N. 36 W.	1.0	N. 49 W.	1.5
250	S. 76 W.	1.2	N. 63 W.	0.4	N. 65 E.	0.4	S. 83 W.	1.7	N. 28 W.	0.4	S. 69 W.	0.9	N. 28 W.	0.4	S. 69 W.	0.9	S. 68 W.	2.7	S. 80 W.	2.2	N. 55 W.	3.1	N. 64 W.	3.4
500	S. 71 W.	2.0	S. 58 W.	0.9	N. 88 W.	0.4	S. 83 W.	3.3	N. 37 W.	1.0	S. 50 W.	1.7	N. 37 W.	1.0	S. 50 W.	1.7	S. 65 W.	6.3	S. 68 W.	4.0	N. 70 W.	5.3	N. 68 W.	5.2
750	S. 71 W.	2.6	S. 57 W.	2.0	N. 83 W.	0.8	S. 80 W.	4.6	N. 69 W.	1.9	S. 56 W.	2.5	N. 69 W.	1.9	S. 56 W.	2.5	S. 71 W.	8.6	S. 71 W.	5.7	N. 79 W.	6.9	N. 67 W.	6.6
1,000	S. 89 W.	3.8	S. 68 W.	2.9	N. 75 W.	2.4	S. 85 W.	5.9	N. 67 W.	2.6	S. 66 W.	3.6	N. 67 W.	2.6	S. 66 W.	3.6	S. 84 W.	9.2	S. 80 W.	7.0	N. 77 W.	8.2	N. 71 W.	8.0
1,250	N. 87 W.	5.0	S. 86 W.	4.0	S. 86 W.	4.3	S. 86 W.	7.5	N. 72 W.	3.3	S. 74 W.	4.7	N. 72 W.	3.3	S. 74 W.	4.7	S. 83 W.	10.5	S. 86 W.	7.9	---	---	---	---
1,500	N. 83 W.	5.7	W.	4.8	N. 85 W.	7.2	S. 89 W.	9.6	N. 84 W.	4.5	S. 78 W.	6.1	N. 84 W.	4.5	S. 78 W.	6.1	N. 89 W.	11.5	N. 89 W.	9.2	N. 72 W.	12.2	N. 69 W.	10.3
2,000	N. 84 W.	7.1	N. 84 W.	6.7	S. 79 W.	12.2	S. 68 W.	13.7	N. 84 W.	6.8	S. 86 W.	7.6	N. 82 W.	13.5	N. 84 W.	11.4	N. 82 W.	13.5	N. 84 W.	11.4	N. 77 W.	15.0	N. 70 W.	12.0
2,500	N. 77 W.	8.2	N. 83 W.	7.7	N. 85 W.	16.2	W.	14.7	N. 47 W.	12.9	N. 62 W.	11.5	S. 87 W.	9.7	S. 86 W.	8.9	N. 79 W.	14.4	N. 84 W.	13.0	N. 75 W.	16.1	N. 73 W.	14.2
3,000	N. 68 W.	9.7	N. 83 W.	9.7	S. 82 W.	14.7	S. 87 W.	16.1	N. 49 W.	13.3	N. 65 W.	12.7	S. 80 W.	12.6	S. 85 W.	10.8	N. 85 W.	16.0	N. 88 W.	13.8	N. 72 W.	15.8	N. 75 W.	15.2
3,500	N. 80 W.	11.4	N. 71 W.	11.0	N. 68 W.	27.1	N. 87 W.	17.3	N. 50 W.	14.6	N. 68 W.	13.0	S. 83 W.	13.6	S. 89 W.	11.5	N. 85 W.	21.6	N. 87 W.	15.8	N. 68 W.	18.7	N. 74 W.	17.0
4,000	N. 87 W.	6.6	N. 73 W.	11.0	---	---	---	---	N. 45 W.	15.0	N. 68 W.	14.0	N. 65 W.	6.5	N. 88 W.	11.6	N. 68 W.	21.0	S. 87 W.	15.2	N. 64 W.	15.3	N. 77 W.	18.1
4,500	N. 79 W.	8.7	N. 73 W.	11.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	N. 56 W.	10.5	N. 76 W.	21.2
5,000	N. 55 W.	12.3	N. 81 W.	12.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	N. 54 W.	8.9	N. 89 W.	16.0

WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By P. C. DAY

GENERAL CONDITIONS

February, 1928, was notably free from the more severe weather that frequently prevails during the closing month of winter. Moderately mild temperatures, general absence of severe storms, and little snow cover over large areas afforded unusual opportunity for outdoor occupations.

PRESSURE AND WINDS

Moderate anticyclonic conditions prevailed during much of the month over the Plateau and far Western States, as was the case in January, and no cyclones of importance entered the United States from the Pacific coast during the entire month, a condition rather unusual for February.

Among the more important cyclones of the month over the eastern two-thirds of the country may be mentioned the following:

About the 6th a low-pressure area had moved into the southern Plains region, with center over Oklahoma, attended by light rains over portions of the southern Mountain and Plains States and to some extent in the States to the eastward. By the morning of the 7th the center of low pressure had advanced to Iowa and precipitation had occurred over most of the Mississippi Valley and eastward into the Lake region, Ohio Valley, and Southeastern States. During the following 48 hours the storm area advanced to the Atlantic coast attended by widespread precipitation, mostly rain, but with some snow from the Great Lakes eastward.

Generally clear weather prevailed thereafter until the 13th, when a low-pressure area in the Southwest developed into a general rainstorm central over southwestern Missouri. This storm moved to the southern end of Lake Michigan by the morning of the 14th and precipitation, mostly rain, had extended over much of the country from the Great Plains eastward to the Appalachian Mountains and South Atlantic coast. A secondary storm had developed in the meantime over the Gulf of Mexico and moved to the South Carolina coast.

By the following morning the two storms had advanced to New England, attended by widespread precipitation from the Great Lakes and Ohio Valley to the middle and North Atlantic coast.

More or less scattered precipitation occurred on the 16th and 17th from the Rocky Mountains eastward and by the morning of the 18th general cyclonic conditions existed from the Ohio Valley eastward, rather heavy rains occurring over the east Gulf and South Atlantic coasts and general but usually light snows over the Ohio Valley, Lake region, and Northeastern States.

Probably the most important cyclone of the month entered the northwestern section about the 21st, and by the morning of the 22d it was central over Colorado, attended by light snows in the Northern States as far east as the upper Lakes, and by some heavy rains in eastern Texas and portions of near-by areas.

As this storm moved over the Great Plains it separated into two distinct tracks, one moving northeast to the upper Lakes and the other southeast to the lower Mississippi Valley, the precipitation area extending to the Atlantic and Gulf coasts with heavy rains falling over the Southeastern States, and moderate snows in portions of the upper Mississippi Valley, upper Lake region, and New England.

The last half of the third decade was without precipitation over nearly all parts of the country, the last few days, except the 29th, being particularly free from clouds.

The distribution of the average pressure for the month, its departure from the normal, and the change from the preceding month are shown on Charts II, III, and VI.

In the absence of important barometric depressions there were few strong winds and damage to property from these was relatively small. The details concerning wind and other storms during the month are shown in the usual table at the end of this section.

TEMPERATURE

The month was moderately mild throughout, but the first half was distinctly so over much of the country. The first week was warmer than normal save over the extreme Northeastern States, and was decidedly warm over all sections from the Mississippi River westward, the positive departures ranging up to nearly 20°.