AEROLOGICAL OBSERVATIONS

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In Table 1 are shown the mean monthly free-air temperatures and relative humidities. While normals are not available at all of these stations, the means in such cases were compared with the normals of near-by aerological stations. The temperature departures were positive in all cases with the largest values occurring at Cleveland. Relative humidities were above normal at all levels at Dallas and Due West and at the lower levels at Cleveland, Chicago, and Omaha and below normal elsewhere.

At and below the 1,000-meter level the monthly resultant winds contained a greater southerly component than normal over a large portion of the southern and central part of the country. (Table 2.) Over New England the resultant velocities were mostly above normal. At 3,000 meters the monthly resultants were close to the normal values at all stations except in the extreme northwest and southeast. In the former region the monthly resultant direction was northerly as compared to a normal westerly and in the latter region this direction was easterly as compared to a normal northerly. In most cases the resultant velocities were less than normal.

In Table 3 are shown the mean and extreme heights reached during the month. Three airplane observations were missed during the month at Omaha and one at Chicago, due to unfavorable weather conditions.

TABLE 1.—*Mean free-air temperatures and humidities obtained by airplanes (or kites) during November, 1931*

TEMPERATURE (°C.)

Altitude (meters) m. s. l.	Chicago, Ill.[1] (190 meters)	Cleveland, Ohio[1] (245 meters)	Dallas, Tex.[1] (149 meters)	Due West, S. C.[2] (217 meters)	Ellendale, N. Dak.[2] (444 meters)	Hampton Roads, Va.[3] (3 meters)	Omaha, Nebr.[1] (299 meters)	Pensacola, Fla.[3] (2 meters)	San Diego, Calif.[3] (9 meters)
Surface	7.4	7.4	12.9	11.7	−0.4	12.2	4.6	16.8	16.7
500	7.3	7.7	14.1	12.9	0.0	14.4	5.3	17.3	13.8
1,000	6.5	7.2	13.2	12.2	1.6	11.7	6.5	14.9	12.1
1,500	4.2	5.1	11.9	9.6	1.0	------	5.5	------	------
2,000	2.8	3.4	9.8	7.8	−0.9	5.0	4.3	10.9	6.9
2,500	0.8	1.6	7.3	6.1	−3.5	------	2.5	------	------
3,000	−1.7	−0.7	5.2	4.4	−5.9	1.7	−0.5	6.9	1.0
4,000	−6.5	−5.0	−0.6	−1.2	−11.1	------	−6.9	------	------
5,000	−11.5	−9.8	−7.5	------	−17.1	------	−13.7	------	------
6,000	------	−17.2	−15.7	------	------	------	−21.1	------	------

RELATIVE HUMIDITY (PER CENT)

Altitude (meters) m. s. l.	Chicago, Ill.[1] (190 meters)	Cleveland, Ohio[1] (245 meters)	Dallas, Tex.[1] (149 meters)	Due West, S. C.[2] (217 meters)	Ellendale, N. Dak.[2] (444 meters)	Hampton Roads, Va.[3] (3 meters)	Omaha, Nebr.[1] (299 meters)	Pensacola, Fla.[3] (2 meters)	San Diego, Calif.[3] (9 meters)
Surface	83	78	84	76	78	81	82	86	58
500	75	74	75	69	76	62	75	77	58
1,000	69	70	68	65	63	60	62	72	47
1,500	61	67	65	64	56	------	55	------	------
2,000	51	55	64	62	52	55	46	59	33
2,500	45	49	60	52	54	------	40	------	------
3,000	44	46	49	45	55	23	41	48	31
4,000	36	36	44	41	62	------	39	------	------
5,000	33	30	41	------	80	------	36	------	------
6,000	------	20	79	------	------	------	35	------	------

[1] Airplanes (Weather Bureau). [2] Kites. [3] Airplanes (Navy).

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a. m (E. S. T.) during November, 1931*

Altitude (meters) m. s. l.	Albuquerque, N. Mex. (1,528 meters)		Brownsville, Tex. (12 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,873 meters)		Chicago, Ill. (198 meters)		Cleveland, Ohio (245 meters)		Dallas, Tex. (154 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (14 meters)		Key West, Fla. (11 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	N 10 E	0.3	S 43 E	1.1	S 29 W	2.5	N 76 W	4.5	S 48 W	3.1	S 24 W	3.0	S 29 E	2.2	N 33 E	0.9	N 53 W	1.8	S 61 W	2.6	N 6 W	1.7	N 49 E	3.8
500	------	----	S 29 E	8.7	S 39 W	7.4	------	----	S 69 W	7.4	S 57 W	8.4	S 2 W	6.7	N 16 E	0.2	N 64 W	2.1	------	----	N 60 E	5.5	N 66 E	11.3
1,000	------	----	S 23 E	10.3	S 70 W	7.1	------	----	S 80 W	10.5	S 72 W	10.1	S 34 W	6.9	S 31 W	1.2	N 79 W	4.6	S 66 W	5.0	N 76 E	4.2	S 78 E	10.4
1,500	------	----	S 13 E	8.2	S 89 W	9.9	------	----	S 82 W	10.5	S 78 W	10.9	S 58 W	7.0	S 73 W	1.7	N 73 W	6.1	S 83 W	6.6	N 87 E	3.1	N 80 E	9.0
2,000	S 43 W	1.8	S	5.8	N 87 W	10.5	N 80 W	6.2	S 80 W	10.6	S 86 W	11.6	S 72 W	6.4	N 80 W	3.2	N 71 W	8.6	N 82 W	9.0	N 3 E	2.4	N 70 E	8.6
2,500	S 64 W	3.9	S 2 E	4.7	N 89 W	9.8	N 68 W	8.9	------	----	N 89 W	12.3	S 65 W	6.6	N 74 W	4.0	N 73 W	10.3	N 81 W	10.4	N 18 W	2.8	N 76 E	7.3
3,000	S 72 W	5.5	S	2.1	S 83 W	11.3	N 80 W	6.2	------	----	------	----	S 61 W	7.2	N 77 W	4.6	N 72 W	11.9	N 72 W	9.7	N 42 W	6.0	N 73 E	7.1
4,000	S 64 W	9.4	S 26 E	1.3	------	----	W	7.7	------	----	------	----	S 79 W	9.7	N 69 W	7.4	------	----	N 82 W	13.8	N 70 W	10.4	N 24 E	5.7
5,000	S 76 W	9.6	S 47 W	0.7	------	----	S 83 W	10.4	------	----	------	----	------	----	N 59 W	9.7	------	----	------	----	------	----	------	----

Altitude (meters) m. s. l.	Los Angeles, Calif. (217 meters)		Medford, Oreg. (410 meters)		Memphis, Tenn. (89 meters)		New Orleans, La. (25 meters)		Oakland, Calif. (8 meters)		Oklahoma, City, Okla. (392 meters)		Omaha, Nebr. (299 meters)		Phoenix, Ariz. (356 meters)		Salt Lake City, Utah (1,294 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (14 meters)		Washington, D. C. (10 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	N 35 W	0.4	S 11 E	0.1	S 13 E	1.5	N 86 E	1.6	N 41 E	1.9	S 10 W	1.8	S 4 W	0.7	N 87 E	2.3	S 20 E	3.0	S 65 W	1.3	S 43 E	1.7	S 20 W	0.8
500	N 43 E	1.3	N 8 E	0.3	S 14 W	6.1	S 48 E	7.0	N 2 E	3.7	S 15 W	4.2	S 58 W	2.6	S 86 E	2.6	------	----	S 75 W	5.8	S 23 W	3.1	S 84 W	5.9
1,000	N 62 E	1.8	S 7 W	0.9	S 43 W	5.4	S 45 E	4.4	N 5 W	5.3	S 51 W	8.2	S 87 W	7.2	S 69 E	1.7	------	----	N 83 W	9.5	S 20 W	3.5	N 73 W	6.7
1,500	N 43 E	2.5	S 35 W	2.9	S 46 W	5.9	S 46 E	2.0	N 12 W	6.2	S 62 W	7.5	S 87 W	8.6	S 4 E	1.4	S 8 E	4.7	N 59 W	9.3	S 75 W	1.3	N 70 W	9.0
2,000	N 4 W	3.4	S 78 W	3.5	S 75 W	3.0	N 45 E	1.3	N 11 W	5.7	S 59 W	7.8	N 83 W	9.4	S 27 W	2.2	S 19 W	3.6	N 70 W	9.7	N 1 E	2.5	N 67 W	9.6
2,500	N 29 W	3.4	N 67 W	3.1	S 65 W	3.8	S 62 E	0.5	N 7 W	7.5	S 63 W	7.5	N 89 W	9.4	S 74 W	2.9	S 48 W	2.7	------	----	N 8 W	3.7	N 72 W	10.6
3,000	N 48 W	4.5	N 57 W	3.5	S 48 W	5.4	S 85 W	3.5	N 14 W	8.6	S 62 W	7.7	N 79 W	8.8	S 66 W	3.0	S 76 W	2.7	------	----	N 9 W	4.5	N 76 W	12.0
4,000	------	----	N 32 W	4.4	------	----	------	----	N 21 W	8.4	N 87 W	7.1	N 82 W	8.4	S 46 W	3.0	N 68 W	3.2	------	----	------	----	------	----
5,000	------	----	------	----	------	----	------	----	------	----	------	----	------	----	------	----	N 59 W	3.4	------	----	------	----	------	----

TABLE 3.—*Observations by means of airplanes, kites, captive and limited-height sounding balloons during November, 1931*

	Dallas, Tex.[1]	Due West, S. C.[2]	Ellendale, N. Dak.[2]	Chicago, Ill.[1]	Cleveland, Ohio[1]	Omaha, Nebr.[1]
Mean altitudes, meters, m. s. l., reached	5,476	2,616	2,970	4,603	5,526	6,208
Maximum altitude, meters, m. s. l., reached	6,018	4,692	5,069	5,110	6,018	6,793
Number of flights made	30	30	27	29	30	27
Number of days on which flights were made	30	30	26	29	30	27

[1] Airplanes. [2] Kite.