AEROLOGICAL OBSERVATIONS

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Free-air temperatures were decidedly above normal at Chicago, Cleveland, Dallas, Ellendale, Omaha, and Washington, with the greatest departures therefrom occurring at Omaha at 2,000 and 2,500 meters. At Due West the departures were small and negative at the higher levels. Normal temperatures for Hampton Roads, Pensacola, and San Diego are not available.

In connection with the large positive temperature departures at Omaha it will be noted from Table 2 that the resultant wind movement for the month based on 7 a. m. observations contained a large southerly component as compared with the resultants at Chicago and Cleveland, in practically the same latitude.

The relative humidity departures from the normal were mostly negative at the lower levels and positive at the higher levels.

The free-air resultant wind directions for the month at the 1,000-meter level were close to normal, while the resultant velocities were considerably in excess of the normal at most stations. At 3,000 meters the resultant directions were close to normal at the northern stations but differed appreciably at a number of southern and west coast stations. In most cases where the monthly resultant direction varied from the normal the resultant velocity was below normal.

From Table 3 it will be noted that airplane observations were obtained at all four stations on every day during the month. The maximum altitude reached was 7,018 meters above sea level at Omaha on the 13th.

TABLE 1.—*Mean free-air temperatures and humidities obtained by airplanes (or kites) during September, 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.[3] (444 meters)	Hampton Roads, Va.[2] (2 meters)	Omaha, Nebr.[1] (299 meters)	Pensacola, Fla.[3] (2 meters)	San Diego, Calif.[3] (9 meters)	Washington, D. C.[3] (2 meters)
Surface	17.3	17.1	23.3	23.4	18.0	24.1	18.4	24.6	21.4	21.0
500	18.2	18.4	24.1	21.5	17.9	22.3	19.1	23.7	17.8	21.2
1,000	17.9	17.5	23.4	18.7	16.9	19.9	20.8	21.2	19.0	19.7
1,500	16.1	15.1	21.2	15.7	14.7		19.6			
2,000	13.8	12.5	18.3	13.0	12.2	14.4	17.0	15.5	15.8	14.5
2,500	10.9	10.0	15.5	10.1	9.5		13.9			
3,000	8.1	7.6	12.7	7.4	6.3	8.1	10.5	9.7	9.8	9.0
4,000	1.9	2.4	5.9	0.8	−0.3		3.7	1.7		2.9
5,000	−4.3	−2.8	0.3	−5.4	−6.9		−3.1			
6,000		−7.2	−3.9		−12.6		−9.9			
7,000							−18.4			

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.[3] (444 meters)	Hampton Roads, Va.[2] (2 meters)	Omaha, Nebr.[1] (299 meters)	Pensacola, Fla.[3] (2 meters)	San Diego, Calif.[3] (9 meters)	Washington, D. C.[3] (2 meters)
Surface	85	84	71	73	61	72	78	86	69	78
500	74	74	66	70	60	67	72	76	76	65
1,000	64	67	59	68	52	66	57	72	50	59
1,500	58	63	59	66	51		53			
2,000	55	59	58	62	52	58	53	64	28	56
2,500	56	54	55	57	52		53			
3,000	54	48	54	53	54	46	55	56	21	53
4,000	53	44	54	55	58		53	52		54
5,000	47	45	42	66	59		50			
6,000		95	75		57		47			
7,000							74			

[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 September, 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 28° E	0.5	S 66° E	0.9	S 2° W	1.9	N 86° W	3.5	S 17° W	1.5	S 13° W	1.6	S 27° E	2.0	N 41° E	0.7	N 81° W	1.0	S 84° W	0.9	N 17° W	1.3	S 79° E	2.1
500			S 46° E	6.2	S 62° W	3.4			S 50° W	6.5	S 62° W	5.6	S 17° W	8.5	N 15° W	1.1	S 85° W	0.9			N 65° E	3.8	S 72° E	5.4
1,000			S 36° E	6.5	N 71° W	6.3			S 72° W	6.6	S 84° W	6.9	S 17° W	8.2	N 13° E	1.2	S 54° W	3.0	S 85° W	2.6	S 84° E	3.1	S 68° E	4.9
1,500			S 43° E	5.6	N 67° W	9.0			S 89° W	6.8	S 87° W	7.4	S 13° W	4.8	N 27° E	1.5	S 82° W	5.6	N 75° W	5.0	E	3.1	S 76° E	4.4
2 000	S 27° W	2.4	S 51° E	5.1	N 44° W	11.3	S 87° W	5.4	N 89° W	8.3	S 86° W	7.8	S 13° W	3.5	N 11° W	0.9	S 89° W	6.3	N 85° W	5.3	N 86° E	3.3	S 77° E	3.4
2,500	S 58° W	3.5	S 76° E	4.7	N 43° W	12.6	S 80° W	7.7	N 73° W	7.9		W 9.0	S 11° W	2.4	N 4° E	1.2	S 87° W	8.2	S 83° W	6.2	N 79° E	4.1	S 83° E	3.9
3,000	S 58° W	5.3	S 82° E	5.4	N 52° W	11.6	S 84° W	8.0	N 69° W	8.1	N 80° W	9.8	S 30° E	1.0	N 13° W	2.1	S 81° W	9.8	S 70° W	6.9	N 77° E	3.6	S 89° E	4.2
4,000	S 63° W	6.3	N45° E	6.5			S 86° W	7.6	N 64° W	8.6	N 78° W	9.3	N 9° E	1.8	N 37° W	2.9	N 86° W	11.1			N 57° E	3.9	N 80° E	4.3
5,000	S 59° W	5.9					S 82° W	7.6			S 85° W	8.1			N 40° W	3.5	N 87° W	10.3			N 31° E	2.1	N 60° E	3.3

A titude (meters) m. s. l.	Los Angeles, Calif. (127 meters)		Medford, Oreg. (410 meters)		Memphis, Tenn. (145 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 (1,294meters)		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 23° E	0.7	S 31° W	0.1	S 5° W	1.3	N 42° E	1.0	S 45° E	0.2	S	3.5	S 37° E	1.7	S 85° E	1.6	S 28° E	3.5	N 33° E	0.3	S 31° E	1.5	N 50° W	0.5
500	S 89° E	0.8	S 61° W	0.3	S 47° W	4.9	N 89° E	2.4	N 39° W	2.5	S 12° W	7.9	S 1° W	4.5	S 69° E	1.7			N 86° W	2.5	S 45° W	2.7	N 58° W	2.9
1 000	S 76° E	0.7	N 79° W	0.8	S 50° W	4.5	S 57° E	2.5	N 1° E	3.6	S 31° W	13.9	S 40° W	11.6	S 15° E	0.5			N 76° W	6.2	S 40° W	2.6	N 53° W	4.3
1 500	S 50° W	1.1	S 24° E	0.6	S 49° E	4.3	S 49° E	2.9	N 5° W	1.8	S 46° W	9.4	S 49° W	10.4	S 26° W	2.1	S 12° E	5.5	N 76° W	6.9	S 66° W	1.5	N 62° W	5.8
2,000	S 24° W	2.9	S 37° W	0.6	S 38° W	3.0	S 62° E	2.9	N 12° W	3.1	S 43° W	6.2	S 53° W	9.1	S 14° W	3.6	S 13° W	5.0	N 70° W	7.3	N 83° W	0.9	N 67° W	6.9
2,500	S 39° W	4.3	S 71° W	2.4	S 31° W	4.2	S 71° E	2.5	N 15° W	4.4	S 46° W	3.8	S 70° W	6.2	S 20° W	5.8	S 35° W	4.3	N 74° W	9.2	N 6° E	2.7	N 68° W	6.1
3,000	S 33° W	5.1	N 86° W	3.2	S 27° E	1.4	N 83° E	1.0	N 14° W	4.7	N 32° W	1.3	S 48° W	5.7	S 26° W	6.6	S 50° W	5.4	N 68° W	10.7			N 75° W	6.3
4,000			N 44° W	3.3			N 42° E	2.0			N 3° W	1.6	S 59° W	2.8			S 68° W	7.6	N 72° W	10.7			N 89° W	4.8
5,000							N 82° E	1.5									S 88° W	4.5						

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

	Dallas, Tex.[1]	Due West, S. C.	Ellendale, N.Dak.	Chicago, Ill.[1]	Cleveland, Ohio[1]	Omaha, Nebr.[1]
Mean altitudes (meters), m. s. l., reached during month	5,625	2,747	3,245	5,070	5,688	6,528
Maximum altitude (meters), m. s. l., reached	6,013	[2] 5,431	[2] 6,824	5,519	6,089	7,018
Number of flights made	30	30	31	30	30	30
Number of days on which flights were made	30	29	29	30	30	30

[1] Airplanes. [2] Limited-height sounding balloon flights.