SOUNDING-BALLOON OBSERVATIONS AT ROYAL CENTER, IND., DURING THE INTERNATIONAL MONTH, SEPTEMBER, 1930

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[Weather Bureau, Washington, D. C., July, 1931]

In cooperation with the International Commission for the Exploration of the Upper Atmosphere the Weather Bureau conducted a series of sounding-balloon observations at the Royal Center,[1] Ind., aerological station during the international month, September, 1930. The same general program was followed as at Broken Arrow, Okla., during December, 1929, and the reader is referred to Monthly Weather Review, August, 1931, for further details regarding this. There were 36 balloons released at Royal Center and 34 (94 per cent) of the instruments returned. This is probably the highest percentage ever returned for a complete monthly series in this country.

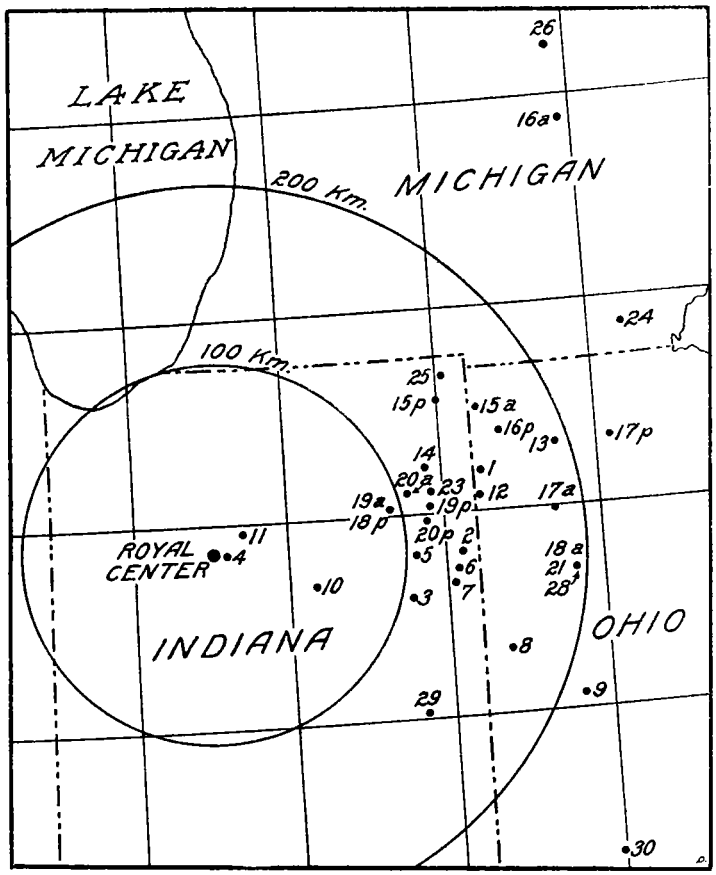

FIGURE 1.—Landing places (with dates of ascent) of meteorographs released from Royal Center, Ind., during September, 1930

The altitudes determined hypsometrically were, in general, slightly higher than those computed trigonometrically from the 2-theodolite observations, the differences averaging less than 5 per cent.

The average maximum altitude reached during the series was 12,122 meters and the extreme maximum altitude reached was 23,846 meters, on the afternoon of the sixteenth.

Following are some of the significant features of the tropopause obtained for the more recent monthly series of sounding balloon observations made in this country. (See Figure 1.)

[1] Lat. 40° 53′ N., long. 86° 29′ W.

	Date	Mean height of tropopause	Mean temperature of tropopause	Maximum height of tropopause observed	Minimum height of tropopause observed	Range in height of tropopause observed
		Meters	° *C.*	*Meters*	*Meters*	*Meters*
Royal Center, Ind.	September, 1930	12,914	−59.3	14,615	10,898	3,717
Broken Arrow, Okla.[1]	December, 1929	10,083	−54.0	12,212	7,728	4,484
Groesbeck, Tex.[2]	October, 1927	14,823	−65.5	17,467	11,695	5,772
Royal Center, Ind.[3]	May, 1926	12,011	−58.4	15,840	8,878	6,962

[1] MONTHLY WEATHER REVIEW, August, 1931, pp. 297-309.
[2] MONTHLY WEATHER REVIEW, June, 1929, pp. 231-246.
[3] MONTHLY WEATHER REVIEW, July, 1927, pp. 293-307.

The mean temperature curve for the month together with the altitude and temperature of the tropopause for the individual observations and the corresponding dates are shown in Figure 2. The maximum monthly average lapse rate and the altitude at which it occurred is given below for the more recent monthly series of sounding-balloon observations in this country.

	Date	Maximum average lapse rate	Altitude interval of occurence
		°*C/100 m.*	*km.*
Royal Center, Ind.	September, 1930	0.77	9-10
Broken Arrow, Okla.[1]	December, 1929	.77	6-7
Groesbeck, Tex.[2]	October, 1927	.79	7-8
Royal Center, Ind.[3]	May, 1926	.71	7-8

[1] MONTHLY WEATHER REVIEW, August, 1931, pp. 297-309.
[2] MONTHLY WEATHER REVIEW, June, 1929, pp. 231-246.
[3] MONTHLY WEATHER REVIEW, July, 1927, pp. 293-307.

In Figure 3 are shown the individual temperature-altitude curves. The surface temperature is indicated at the bottom of each curve and the temperature at the maximum altitude at the top. The wind directions whenever observed are indicated for the standard levels adjacent to the corresponding curves.

In Figure 4 are shown the free-air isotherms for the month with the dates indicated across the top. The temperatures in the upper portion of the troposphere did not fluctuate greatly from day to day. In general, they became higher when the sea-level pressure was low and vice versa, i. e., lower when the sea-level pressure was high.

Attention is invited to the successive increase in height of the tropopause from the afternoon of the sixteenth to the afternoon of the nineteenth as shown in Table 1. As would be expected, the prevailing pressure distribution over this region changed from low to high during this period.

Figure 5 shows the mean wind velocity and direction curves for the month. The mean velocities and mean directions were determined independently of each other. It will be noted that the mean velocity reaches a maximum (38.5 m. p. s.) at 12 kilometers, i. e., just below the mean altitude of the tropopause. Above this elevation the mean wind velocity decreases at practically the same rate it increased in the troposphere.

The mean wind direction veers from southwest near the surface to slightly north of west from 2 kilometers to

10 kilometers where it backs to slightly south of west above.

Figure 6 shows the mean free-air relative humidity for the month. These data, however, must be accepted with reservation above 7 kilometers elevation on account of the uncertainty of hair hygrometers at low temperatures. It is known that the lag of hair hygrometers increases as the temperature falls below −15° C.

In Table 2 are given the tabulated data of the individual ascents. The elevation of the tropopause has been indicated in each case where it was observed.

References to previous sounding-balloon series made in this country may be found in MONTHLY WEATHER REVIEW, July, 1927, June, 1929, August, 1931.

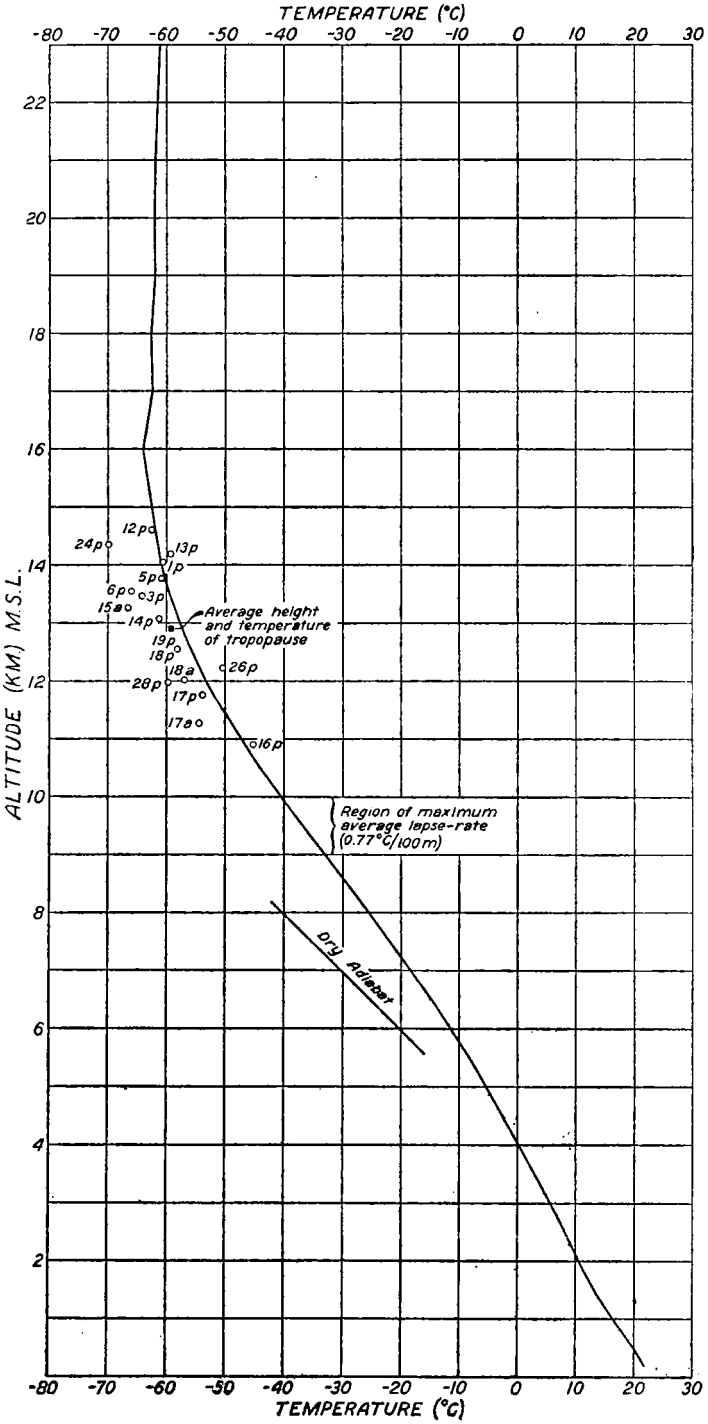

FIGURE 2.—Mean temperature curve (° C.) for September, 1930, Royal Center, Ind. Circles indicate height and temperature of tropopause with corresponding dates

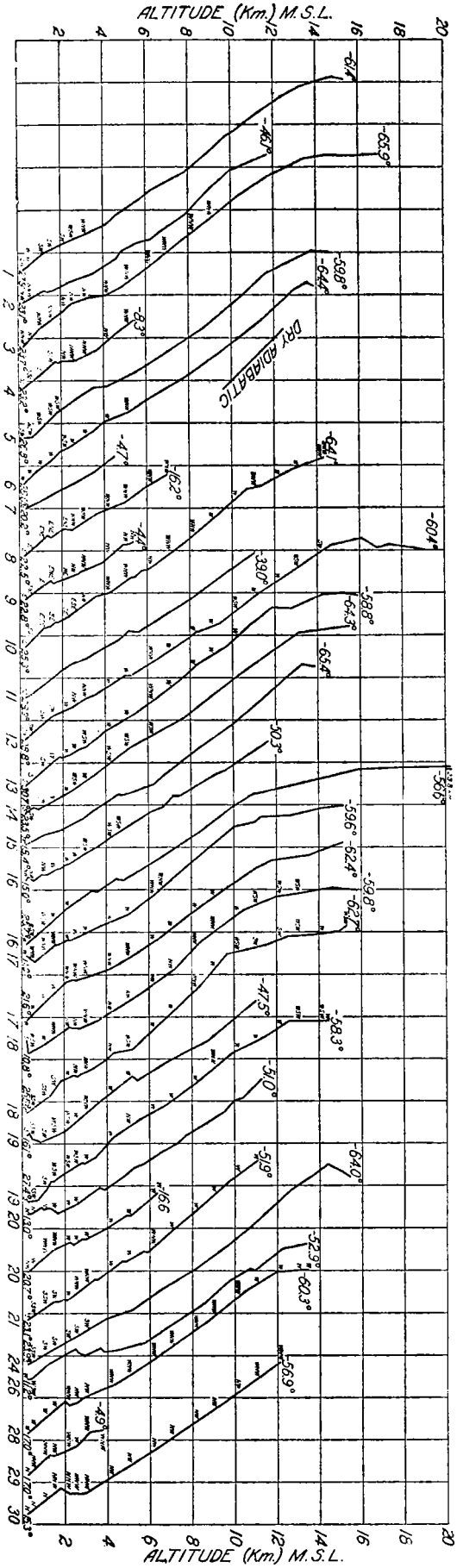

FIGURE 3.—Temperature-altitude curves for individual observations made at Royal Center, Ind., during September, 1930. Dates indicated below; figures at bottom and at top of curves indicate corresponding temperatures ° C. (Abscissa value of each square represents 20° C.)

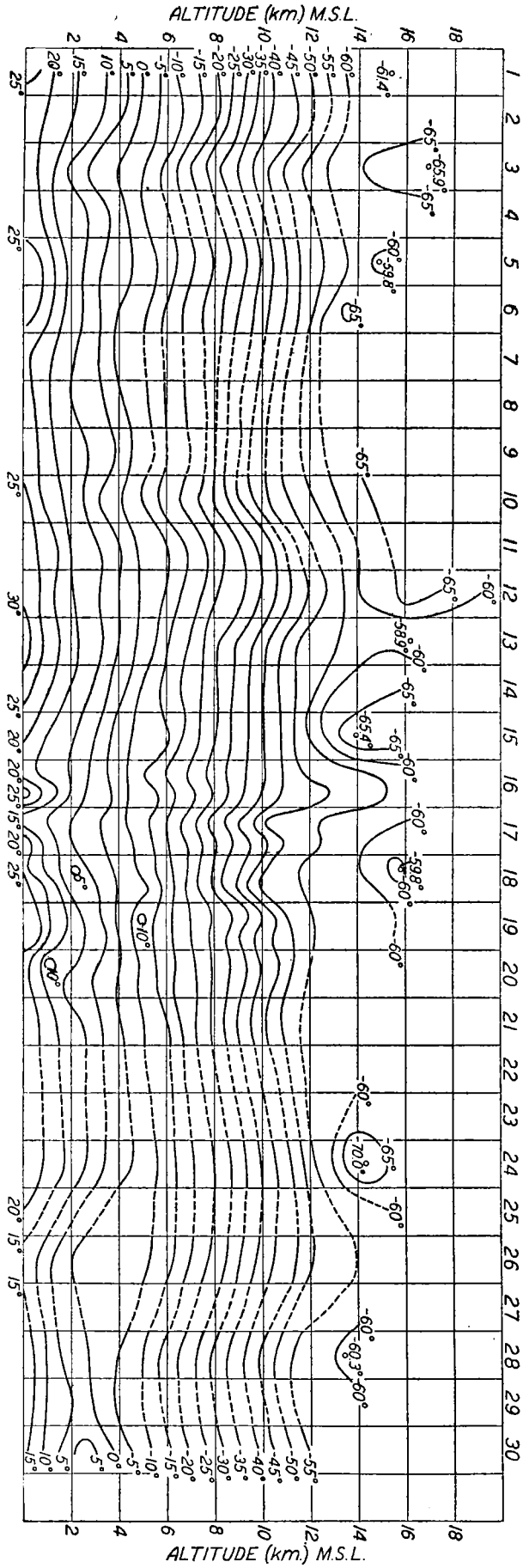

FIGURE 4.—Free-air isotherms (° C.) observed at Royal Center, Ind., during September, 1930. (Broken lines drawn between dates with missing data.)

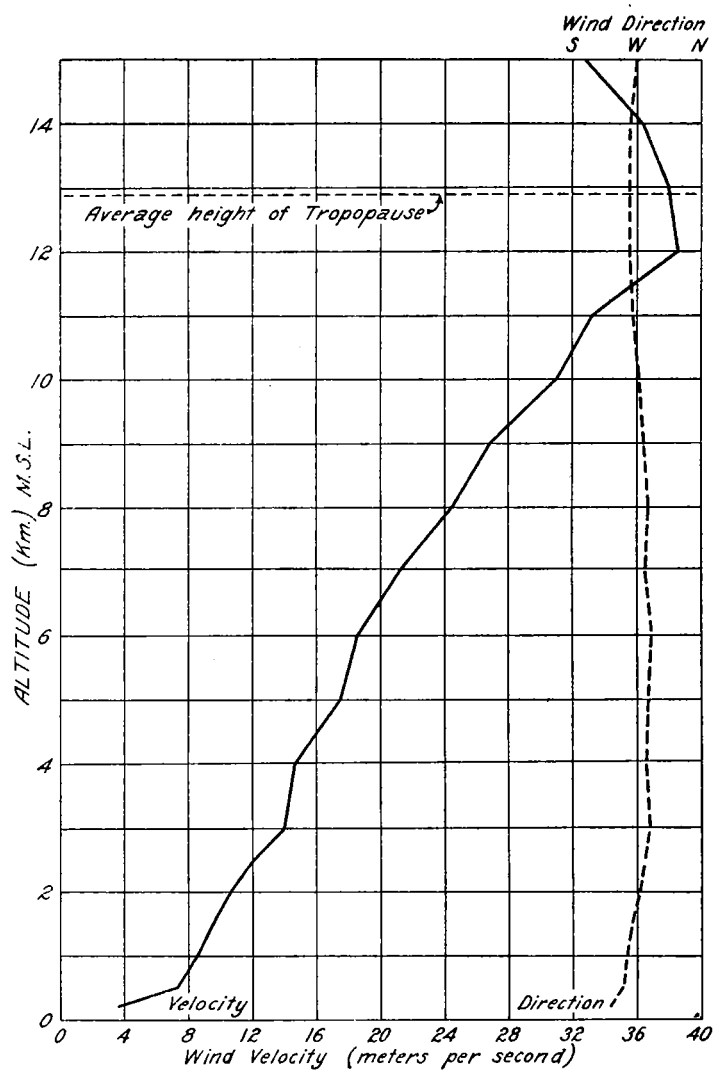

FIGURE 5.—Mean wind velocity (m. p. s.) and direction curves for September, 1930, Royal Center, Ind.

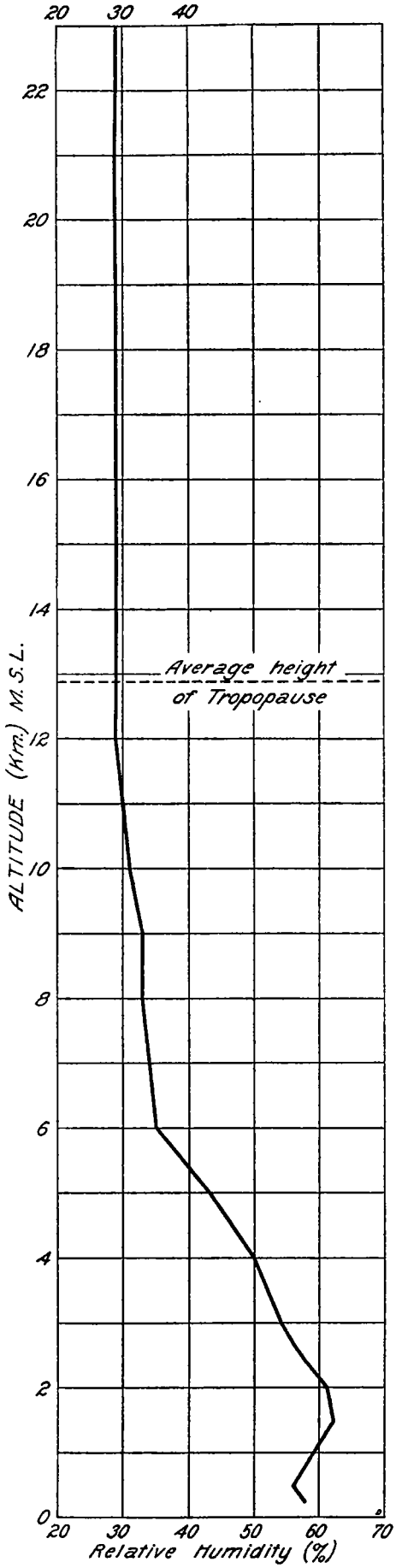

FIGURE 6.—Mean relative humidity curve (per cent) for September, 1930, Royal Center, Ind.

TABLE 1.—*Summary of sounding-balloon observations made at Royal Center, Ind., during September, 1930*

Date	Time of release, 90th Mer.	Stratosphere: Height of base M.S.L.	Stratosphere: Temperature at base	Maximum height reached, M. S. L.	Minimum temperature recorded	Observations: 2-theodolite	Observations: 1-theodolite	Meteorograph found: Distance from station	Meteorograph found: Direction from station
		Meters	*°C.*	*Meters*	*°C.*	*Min.*	*Min.*	*Km.*	
1	4:26 p. m.	14,035	−60.8	15,343	−62.6	74	24	145	ENE.
2	4:15 p. m.			11,751	−46.1	2	2	134	E.
3	4:03 p. m.	13,449	−64.1	16,932	−65.9	63	75	125	E.
4	4:09 p. m.			5,422	−8.3	32	32	7	SE.
5	4:00 p. m.	13,771	−60.7	14,774	−60.7	7	7	105	E.
6	3:59 p. m.	13,535	−66.0	13,879	−66.0	24	29	130	E.
7	4:00 p. m.			[1] 4,498	−57.3	0	0	125	E.
8	4:00 p. m.			6,973	−16.2	59	78	165	ESE.
9	4:09 p. m.			[2] 11,508	−4.4	84	96	210	ESE.
10	4:06 p. m.			[2] 15,453	−64.1	53	53	70	ESE.
11	4:16 p. m.			11,048	−39.0	56	56	20	ENE.
12	4:09 p. m.	14,615	−62.5	19,028	−65.8	79	111	145	E.
13	4:02 p. m.	14,183	−59.2	15,893	−60.1	60	70	390	ENE.
14	4:18 p. m.	13,071	−61.3	15,495	−64.3	17	18	70	ENE.
15	6:16 a. m.	13,248	−66.5	13,888	−66.5	0	0	155	ENE.
15	4:11 p. m.			[2] 5,925		22	23	140	NE.
16	6:20 a. m.			11,675	−50.3	21	21	310	NE.
16	4:01 p. m.	10,898	−45.2	23,846	−58.0	6	6	160	ENE.
17	6:26 a. m.	11,267	−54.4	15,148	−59.6	22	65	170	E.
17	4:13 p. m.	11,766	−53.8	15,141	−62.4	34	38	225	ENE.
18	6:33 a. m.	12,024	−56.9	15,783	−60.9	42	105	195	E.
18	4:01 p. m.	12,534	−58.1	15,298	−62.7	69	72	95	ENE.
19	6:33 a. m.			11,027	−47.5	18	74	95	ENE.
19	4:10 p. m.	12,552	−58.0	[2] 15,519	−63.5	63	66	120	E.
20	6:34 a. m.			11,271	−51.0	9	9	105	ENE.
20	4:10 p. m.			[2] 6,709	−16.6	40	44	110	E.
21	4:27 p. m.			[2] 11,057	−51.9	37	41	195	E.
22	4:00 p. m.			[2] 7,733		34	41	(3)	
23	4:00 p. m.			[2] 3,825		15	17	115	ENE.
24	3:58 p. m.	14,357	−69.9	15,461	−69.9	12	14	250	ENE.
25	3:59 p. m.			[2] 13,283		64	69	155	NE.
26	4:02 p. m.	12,236	−50.4	13,397	−52.9	4	5	330	NE.
27	4:04 p. m.			[2] 1,417		8	14	(3)	
28	4:00 p. m.	11,996	−59.7	[2] 13,488	−60.3	42	47	190	E.
29	4:02 p. m.			[2] 3,923	−57.6	15	41	145	SE.
30	4:04 p. m.			[2] 13,[illegible]	−57.5	44	49	270	SE.

[1] Pressure trace failed at this altitude.
[2] Maximum altitude from 2-theodolite observation.
[3] Not found.

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*

SEPTEMBER 1, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\,m.}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	*M.*	*Mb.*	*°C.*		*P. ct.*	*Mb.*		*M.p.s.*	
4:26	225	991.4	27.9		71	26.71	sw.	3.4	2 Cu., SW;
	500	955.3	25.6		77	25.30	wsw.	7.1	Clouds increased
	1,000	907.2	21.5		87	22.32	sw.	11.6	to 4 Cu. at 4:40 p.
4:31	1,120	895.2	20.5	0.83	90	21.72	sw.	11.9	m.
	1,500	856.9	18.6		83	17.80	sw.	12.7	
	2,000	807.4	16.0		75	13.64	sw.	8.8	
4:36	2,041	804.1	15.8	0.51	74	13.29	sw.	8.8	
	2,500	761.5	13.9		67	10.65	wsw.	5.1	
	3,000	727.4	11.9		60	8.36	wnw.	5.1	
4:42	3,050	713.5	11.7	0.41	59	8.11	wnw.	5.3	
	4,000	636.6	7.3		39	3.99			
4:49	4,119	627.2	6.8	0.46	36	3.56			
4:52	4,627	589.3	2.2	0.91	36	2.58			
	5,000	561.9	−0.3		36	2.15			
4:59	5,669	517.1	−4.9	0.68	36	1.47			
	6,000	494.7	−7.5		36	1.17			
5:05	6,285	477.9	−9.7	0.78	36	0.97			
	7,000	445.0	−13.4		34	0.66			
5:13	7,856	388.8	−17.9	0.52	31	0.39			
	8,000	381.7	−19.1		30	0.34			
5:20	8,961	334.6	−27.1	0.83	27	0.14			
	9,000	332.8	−27.5		27	0.13			
5:24	9,715	300.9	−34.3	0.95	28	0.07			
	10,000	288.8	−36.2		27	0.05			
5:27	10,170	281.9	−37.4	0.68	26	0.04			
	11,000	249.4	−43.7		26	0.02			
5:34	11,248	240.6	−45.6	0.76	26	0.02			
	12,000	214.3	−50.7		26	0.01			
5:41	12,345	203.6	−53.0	0.67	26	0.01			
	13,000	183.9	−56.7		26	(1)			
5:47	13,208	177.9	−57.9	0.57	26	(1)			
	14,000	157.3	−60.7		25	(1)			
5:52	14,035	155.9	−60.8	0.35	25	(1)			Tropopause.
5:58	14,821	137.4	−62.6	0.23	26	(1)			
	15,000	133.6	−62.2		26	(1)			
6:03	15,343	126.3	−61.4	−0.23	26	(1)			

[1] Less than 0.01 mb.

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 2, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	M.	Mb.	°C.		P.ct.	Mb.		M.p.s.	
4:15	225	991.9	23.1	-------	85	24.04	nw.	4.0	10 St. Cu., NW.
	500	962.7	21.5	-------	84	21.55	nnw.	8.1	
	1,000	908.3	18.7	-------	82	17.70	-------	-------	Altitude of St. Cu. base—683 M. m. s. l.
4:18	1,217	884.5	17.5	0.56	81	16.21	-------	-------	
4:19	1,372	868.7	18.2	−0.45	81	16.94	-------	-------	
	1,500	856.4	17.6	-------	80	16.10	-------	-------	
4:20	1,527	853.1	17.5	0.45	80	16.01	-------	-------	
4:21	1,617	844.2	17.5	0.00	76	15.21	-------	-------	
	2,000	807.2	15.6	-------	75	13.30	-------	-------	
4:25	2,473	763.4	13.3	0.49	74	11.31	-------	-------	
	2,500	761.0	13.2	-------	73	11.08	-------	-------	
4:29	3,001	716.8	12.3	0.19	58	8.30	-------	-------	
4:33	3,515	674.1	9.7	0.51	29	3.49	-------	-------	
	4,000	634.6	6.6	-------	29	2.82	-------	-------	
4:39	4,613	589.6	2.6	0.65	29	2.13	-------	-------	
4:41	4,852	572.3	−0.7	1.38	28	1.62	-------	-------	
	5,000	561.3	−1.5	-------	30	1.62	-------	-------	
4:46	5,624	519.2	−4.8	0.71	36	1.48	-------	-------	
	6,000	494.8	−5.8	-------	32	1.21	-------	-------	
4:48	6,226	480.9	−6.4	0.27	30	1.07	-------	-------	
4:51	6,619	457.2	−9.7	0.84	38	1.02	-------	-------	
	7,000	434.9	−12.2	-------	35	0.75	-------	-------	
4:58	7,867	388.1	−17.9	0.66	27	0.34	-------	-------	
	8,000	381.4	−18.7	-------	26	0.31	-------	-------	
	9,000	333.2	−24.9	-------	21	0.14	-------	-------	
5:08	9,725	301.2	−29.4	0.62	17	0.07	-------	-------	
	10,000	289.9	−31.5	-------	17	0.06	-------	-------	
5:15	10,931	253.7	−38.4	0.75	17	0.03	-------	-------	
	11,000	251.5	−39.0	-------	17	0.02	-------	-------	
5:20	11,751	224.8	−46.1	0.94	17	0.01	-------	-------	

SEPTEMBER 3, 1930

4:03	225	994.6	23.7	-------	50	14.66	nnw.	5.4	1 Cu., NNW.
	500	962.5	20.7	-------	54	13.19	n.	7.5	
4:08	964	912.8	15.6	1.10	61	10.82	nnw.	5.5	
	1,000	909.3	15.3	-------	61	10.61	nnw.	4.9	
	1,500	857.0	11.5	-------	64	8.68	nnw.	5.6	
	2,000	807.4	7.7	-------	68	7.15	nw.	11.7	
4:13	2,073	799.5	7.1	0.77	68	6.86	nw.	12.2	
4:15	2,491	759.6	3.4	0.89	68	5.30	nw.	14.1	
	2,500	757.8	3.4	-------	68	5.30	nw.	14.2	
	3,000	712.5	1.8	-------	44	3.06	nw.	12.4	
4:18	3,283	688.7	0.9	0.32	31	2.02	nw.	11.5	
	4,000	629.8	−0.2	-------	30	1.80	wnw	10.6	
4:22	4,151	618.0	−0.4	0.15	30	1.77	wnw.	13.0	
4:24	4,849	566.1	−4.1	0.53	28	1.22	wnw.	16.8	
	5,000	555.4	−5.2	-------	27	1.07	wnw.	16.7	
	6,000	488.7	−12.5	-------	22	0.46	wnw.	12.7	
4:30	6,206	475.2	−13.9	0.72	21	0.39	wnw.	19.1	
	7,000	427.5	−20.5	-------	21	0.21	wnw.	22.8	
4:35	7,492	399.9	−24.5	0.82	21	0.14	wnw.	20.4	
	8,000	373.6	−28.3	-------	23	0.10	wnw.	27.0	
	9,000	323.3	−36.0	-------	26	0.05	wnw.	32.8	
4:40	9,025	322.5	−36.1	0.76	26	0.05	wnw.	32.6	
	10,000	278.7	−44.0	-------	22	0.02	-------	-------	
4:46	10,268	268.7	−46.2	0.81	21	0.01	-------	-------	
	11,000	239.6	−51.0	-------	21	0.01	-------	-------	
4:53	11,720	215.1	−55.8	0.66	20	(1)	-------	-------	
	12,000	205.7	−57.1	-------	20	(1)	-------	-------	
	13,000	175.7	−62.0	-------	20	(1)	-------	-------	
4:59	13,449	163.2	−64.1	0.48	20	(1)	-------	-------	Tropopause.
	14,000	149.4	−64.9	-------	20	(1)	-------	-------	
5:04	14,475	138.0	−65.5	0.14	20	(1)	-------	-------	
	15,000	126.6	−65.3	-------	20	(1)	-------	-------	
5:10	15,728	112.4	−65.1	−0.03	20	(1)	-------	-------	
	16,000	107.6	−65.3	-------	20	(1)	-------	-------	
5:14	16,932	92.3	−65.9	0.07	20	(1)	-------	-------	

SEPTEMBER 4, 1930

4:09	225	992.9	23.2	-------	45	12.81	se.	2.2	3 Ci., WSW.
	500	961.0	21.0	-------	48	11.94	sse.	2.2	
	1,000	907.4	16.9	-------	53	10.21	s.	3.0	
4:14	1,026	904.7	16.7	0.81	53	10.08	s.	2.9	
	1,500	855.1	12.8	-------	60	8.87	ssw.	3.0	
4:17	1,727	832.6	10.9	0.83	63	8.22	ssw.	2.6	
4:18	1,862	819.2	11.4	−0.37	44	5.93	wsw.	2.0	
4:19	1,984	807.3	10.6	0.66	34	4.35	nw.	2.1	
	2,000	805.7	10.6	-------	34	4.35	nw.	2.1	
	2,500	759.6	10.4	-------	29	3.66	nnw.	4.8	
4:23	2,656	744.7	10.3	0.04	28	3.51	nnw.	5.3	
	3,000	715.0	8.7	-------	25	2.81	nnw.	5.5	
4:29	3,666	658.8	5.6	0.47	19	1.73	nw.	3.7	
	4,000	632.0	2.8	-------	19	1.42	nw.	5.3	
4:35	4,511	593.3	−1.5	0.84	19	1.03	nw.	6.4	
	5,000	556.8	−5.2	-------	18	0.71	wnw.	7.2	
4:41	5,422	528.4	−8.3	0.75	18	0.55	-------	-------	

[1] Less than 0.01 mb.

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 5, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	M.	Mb.	°C.		P.ct.	Mb.		M.p.s.	
4:00	225	985.9	26.8	-------	56	19.75	sw.	2.0	Few A. Cu., W., 9 St., WSW.
	500	955.0	26.4	-------	54	18.60	wsw.	6.8	
4:01	587	946.2	26.3	0.14	53	18.15	wsw.	7.1	Altitude of St. base—2,106 M. m. s. l.
	1,000	902.5	22.3	-------	60	16.16	wsw.	8.0	
	1,500	852.8	17.4	-------	69	13.72	wsw.	6.8	
4:07	1,801	822.3	14.5	0.97	74	12.22	wsw.	6.9	
	2,000	804.0	13.1	-------	-------	-------	wsw.	6.9	
	2,500	756.1	9.7	-------	-------	-------	-------	-------	
4:11	2,945	716.9	6.6	0.69	-------	-------	-------	-------	
	3,000	712.6	6.3	-------	-------	-------	-------	-------	R. B. 3:55 p. m.; E. 5:15 p. m.; [illegible] 3:50 p. m.
4:13	3,528	667.5	3.0	0.62	-------	-------	-------	-------	
	4,000	630.0	2.9	-------	-------	-------	-------	-------	
4:15	4,081	623.5	2.9	0.18	-------	-------	-------	-------	
	5,000	557.0	−1.7	-------	-------	-------	-------	-------	
4:19	5,500	522.1	−4.2	0.50	-------	-------	-------	-------	
	6,000	491.0	−7.3	-------	-------	-------	-------	-------	
4:21	6,677	448.9	−11.6	0.63	-------	-------	-------	-------	
	7,000	430.2	−13.7	-------	-------	-------	-------	-------	
	8,000	376.3	−20.3	-------	-------	-------	-------	-------	
4:25	8,650	344.9	−24.6	0.66	-------	-------	-------	-------	
	9,000	328.4	−27.6	-------	-------	-------	-------	-------	
	10,000	285.3	−36.0	-------	-------	-------	-------	-------	
4:31	10,590	262.0	−41.0	0.85	-------	-------	-------	-------	
	11,000	246.9	−44.7	-------	-------	-------	-------	-------	
4:35	11,625	224.4	−50.3	0.90	-------	-------	-------	-------	
	12,000	211.2	−52.1	-------	-------	-------	-------	-------	
	13,000	179.7	−57.0	-------	-------	-------	-------	-------	
4:42	13,771	160.4	−60.7	0.48	-------	-------	-------	-------	Tropopause.
	14,000	154.9	−60.5	-------	-------	-------	-------	-------	
4:46	14,774	136.6	−59.8	−0.09	-------	-------	-------	-------	

SEPTEMBER 6, 1930

3:59	225	987.0	28.0	-------	52	19.68	w.	1.3	8 Ci., W.
	500	956.4	25.4	-------	55	17.86	w.	2.2	
4:02	804	924.1	22.5	0.95	58	15.82	w.	3.0	
	1,000	904.0	21.1	-------	61	15.27	w.	3.4	
4:04	1,363	866.2	18.4	0.73	67	14.18	w.	4.8	
	1,500	852.0	17.2	-------	67	13.15	w.	5.4	
4:05	1,623	840.3	16.1	0.88	67	12.26	w.	5.9	
4:07	1,887	814.5	13.4	1.02	82	12.61	w.	6.3	
	2,000	802.7	12.8	-------	76	11.23	wsw.	6.2	
4:09	2,354	770.4	11.0	0.51	56	7.35	wsw.	5.2	A. Cu. clouds appeared after balloon was released. 3 A. Cu., W. at 4:28 p. m.
	2,500	757.0	10.0	-------	56	6.88	w.	5.3	
	3,000	712.3	6.6	-------	56	5.45	w.	5.5	
4:12	3,244	691.7	5.0	0.67	56	4.88	wnw.	5.0	
4:13	3,535	667.4	3.0	0.69	50	3.79	w.	5.6	
4:15	3,979	631.6	−0.9	0.88	63	3.57	w.	8.5	
	4,000	630.8	−1.0	-------	63	3.55	w.	8.8	
	5,000	555.0	−4.8	-------	40	1.64	wnw.	11.9	
4:21	5,118	547.1	−5.3	0.39	37	1.45	wnw.	13.1	
	6,000	487.9	−10.8	-------	39	0.95	-------	-------	
4:26	6,489	458.3	−13.9	0.63	41	0.76	-------	-------	
	7,000	427.9	−16.9	-------	43	0.60	-------	-------	
4:31	7,857	381.8	−21.9	0.58	46	0.40	-------	-------	
	8,000	374.6	−23.0	-------	-------	-------	-------	-------	
	9,000	326.1	−30.2	-------	-------	-------	-------	-------	
4:38	9,444	306.3	−33.4	0.72	-------	-------	-------	-------	
	10,000	282.8	−37.7	-------	-------	-------	-------	-------	
	11,000	243.9	−45.4	-------	-------	-------	-------	-------	
4:44	11,406	229.7	−48.6	0.77	-------	-------	-------	-------	
	12,000	209.5	−54.0	-------	-------	-------	-------	-------	
4:51	12,946	180.5	−62.7	0.92	-------	-------	-------	-------	
	13,000	178.8	−63.0	-------	-------	-------	-------	-------	
4:53	13,535	164.0	−66.0	0.56	-------	-------	-------	-------	Tropopause.
4:54	13,879	155.0	−64.4	−0.46	-------	-------	-------	-------	

SEPTEMBER 7, 1930

4:00	225	986.8	20.2	-------	96	22.74	se.	1.7	10 Nb., E.
	500	954.1	18.8	-------	96	20.84	-------	-------	
4:06	915	910.7	16.6	0.52	97	18.33	-------	-------	Raining.
	1,000	901.2	16.1	-------	97	17.75	-------	-------	Balloon entered clouds 1 minute after launching.
	1,500	849.0	13.4	-------	97	14.92	-------	-------	
4:14	1,726	827.6	12.2	0.54	97	13.78	-------	-------	
	2,000	800.0	10.8	-------	97	12.56	-------	-------	
	2,500	754.1	8.3	-------	96	10.51	-------	-------	
4:21	2,646	741.1	7.6	0.50	96	10.02	-------	-------	
	3,000	709.5	5.6	-------	95	8.64	-------	-------	
4:29	3,498	667.8	2.7	0.58	93	6.90	-------	-------	
	4,000	626.8	−0.8	-------	90	5.15	-------	-------	
4:32	4,034	624.8	−1.1	0.71	90	5.02	-------	-------	
4:35	4,498	589.3	−4.7	0.78	52	2.15	-------	-------	

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 8, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	M.	Mb.	°C.		P. ct.	Mb.		M. p. s.	
4:00	225	992.1	22.5	-------	50	13.64	e.	3.7	2 Ci., W.
	500	960.5	20.1	-------	52	12.24	e.	6.1	
4:03	780	930.2	17.6	0.88	55	11.07	ene.	5.4	
	1,000	905.9	15.5	-------	59	10.39	ene.	4.8	
4:05	1,300	874.8	12.6	0.96	64	9.34	ene.	4.4	
4:06	1,457	858.6	13.5	−0.57	60	9.29	ene.	3.8	
	1,500	852.8	13.3	-------	61	9.32	ene.	3.5	
4:07	1,683	835.8	12.2	0.58	65	9.24	e.	2.5	
	2,000	803.7	10.0	-------	72	8.84	ene.	1.7	
4:10	2,076	797.4	9.5	0.69	74	8.78	ne.	1.0	
4:11	2,264	779.5	9.9	−0.21	78	9.52	nw.	2.8	
	2,500	756.5	8.6	-------	78	8.71	wnw.	5.1	
	3,000	712.1	5.8	-------	79	7.28	wnw.	7.7	
4:20	3,626	660.5	2.3	0.56	80	5.77	wnw.	5.9	
	4,000	629.2	0.8	-------	68	4.40	wnw.	9.1	
4:28	4,914	562.4	−2.9	0.40	40	1.92	wnw.	17.1	
	5,000	555.2	−3.5	-------	40	1.83	wnw.	17.5	
4:35	5,912	495.1	−10.1	0.72	35	0.91	wnw.	24.1	
	6,000	489.4	−10.6	-------	34	0.84	wnw.	23.0	
4:40	6,973	430.8	−16.2	0.57	28	0.42	wnw.	23.8	

SEPTEMBER 9, 1930

4:10	225	992.1	22.8	-------	42	11.67	e.	4.0	3 Ci., W., 1 A. Cu., WNW.
	500	960.0	20.7	-------	45	10.99	ene.	5.8	
4:16	854	922.3	18.1	0.75	49	10.18	ene.	5.8	
	1,000	905.5	17.0	-------	50	9.69	e.	3.6	
4:20	1,450	859.8	13.8	0.72	55	8.68	ene.	4.1	
	1,500	853.0	14.4	-------	46	7.55	ene.	4.1	
4:21	1,553	849.3	15.1	−1.26	37	6.35	e.	4.0	
	2,000	804.1	13.4	-------	32	4.92	ne.	2.4	
	2,500	758.0	11.6	-------	27	3.69	nw.	1.2	
4:31	2,521	756.9	11.5	0.37	27	3.66	nw.	1.2	
4:33	2,718	739.3	10.7	0.41	30	3.86	n.	1.4	
4:34	2,830	729.3	10.1	0.54	28	3.46	nnw.	6.0	
	3,000	714.4	9.3	-------	31	3.63	nnw.	4.7	
4:41	3,896	640.8	5.3	0.45	49	4.37	nw.	6.6	
	4,000	632.3	4.4	-------	50	4.18	nw.	7.0	
4:48	4,827	570.8	−2.8	0.87	61	2.96	nw.	11.3	
	5,000	558.5	−3.1	-------	58	2.74	nw.	12.6	
4:50	5,136	549.0	−3.3	0.16	55	2.56	nw.	11.9	
4:51	5,357	533.8	−4.4	0.50	49	2.08	nw.	9.6	
	6,000	-------	-------	-------	-----	------	nw.	12.8	
	7,000	-------	-------	-------	-----	------	wnw.	15.4	
	8,000	-------	-------	-------	-----	------	nw.	31.5	
	9,000	-------	-------	-------	-----	------	wnw.	28.6	
	10,000	-------	-------	-------	-----	------	wnw.	43.2	
	11,000	-------	-------	-------	-----	------	w.	31.6	
5:34	11,508	-------	-------	-------	-----	------	w.	36.0	

SEPTEMBER 10, 1930

4:06	225	989.4	25.3	-------	25	8.07	e.	3.1	1 Ci., WNW.
	500	958.8	22.5	-------	24	6.54	ese.	4.8	
	1,000	903.6	17.4	-------	21	4.17	ese.	5.6	
4:09	1,099	894.0	16.4	1.02	21	3.92	se.	5.8	
4:10	1,418	861.0	15.5	0.28	17	2.99	se.	5.6	
	1,500	852.7	14.9	-------	17	2.88	se.	5.3	
4:11	1,648	837.8	13.7	0.78	17	2.67	se.	4.7	
4:12	1,763	826.4	13.6	0.09	17	2.65	se.	3.8	
	2,000	801.9	12.3	-------	16	2.29	se.	2.5	Pressure record inaccurate; altitudes determined from 2-theodolite observation; pressures computed from altitudes and temperatures.
4:13	2,265	778.3	10.9	0.54	14	1.83	se.	1.4	
	2,500	754.2	9.2	-------	16	1.86	ese.	0.7	
	3,000	710.0	5.5	-------	20	1.81	nw.	0.5	
4:18	3,553	665.1	1.4	0.74	25	1.69	w.	2.8	
	4,000	629.3	0.2	-------	24	1.49	wnw.	4.7	
4:20	4,169	615.9	−0.2	0.26	23	1.38	wnw.	4.6	
4:21	4,511	590.1	−2.5	0.67	25	1.24	wnw.	6.0	
4:22	4,585	584.6	−2.1	−0.54	27	1.39	wnw.	6.8	
	5,000	551.0	−5.6	-------	-----	------	wnw.	8.0	
4:23	5,171	542.6	−7.1	0.85	-----	------	wnw.	8.5	
4:24	5,404	526.6	−7.6	0.21	-----	------	wnw.	10.2	
4:25	5,729	504.9	−10.5	0.89	-----	------	wnw.	11.6	
4:26	5,964	489.7	−10.7	0.09	-----	------	nw.	11.9	
	6,000	487.0	−10.9	-------	-----	------	nw.	11.9	
4:28	6,431	460.7	−13.9	0.68	-----	------	nw.	11.7	
	7,000	426.9	−18.2	-------	-----	------	wnw.	11.5	
4:33	7,829	381.9	−24.4	0.75	-----	------	wnw.	12.5	
	8,000	372.0	−25.9	-------	-----	------	wnw.	11.9	
	9,000	323.7	−34.5	-------	-----	------	w.	15.8	
4:39	9,435	304.5	−38.2	0.86	-----	------	w.	18.4	
	10,000	280.0	−43.1	-------	-----	------	w.	20.2	
4:43	10,639	254.7	−48.9	0.89	-----	------	wnw.	21.0	
	11,000	241.2	−49.7	-------	-----	------	wnw.	24.7	
4:45	11,303	230.2	−50.3	0.21	-----	------	wnw.	25.6	
	12,000	207.2	−54.0	-------	-----	------	w.	27.4	
4:50	12,817	181.9	−58.4	0.54	-----	------	w.	27.5	
	13,000	176.9	−59.1	-------	-----	------	w.	28.0	
	14,000	150.2	−62.8	-------	-----	------	wnw.	23.4	
4:55	14,341	142.4	−64.1	0.37	-----	------	wnw.	24.8	
	15,000	-------	-------	-------	-----	------	wnw.	30.3	
4:59	15,453	-------	-------	-------	-----	------	wnw.	20.0	

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 11, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	M.	Mb.	°C.		P. ct.	Mb.		M. p. s.	
4:16	225	985.4	28.9	-------	50	19.94	se.	1.6	1 Ci., W., 7 Ci. St., W.
	500	955.5	27.5	-------	48	17.64	-------	-------	
4:17	511	954.3	27.4	0.52	48	17.53	-------	-------	
	1,000	903.1	23.6	-------	54	15.74	-------	-------	
	1,500	853.0	19.8	-------	61	14.10	-------	-------	
4:23	1,995	804.4	15.8	0.78	67	12.03	-------	-------	
4:25	2,412	765.7	13.2	0.62	47	7.13	-------	-------	
	2,500	757.5	12.8	-------	47	6.95	-------	-------	
4:26	2,710	739.0	12.0	0.40	46	6.45	-------	-------	
4:27	2,954	717.7	11.2	0.33	41	5.45	-------	-------	
	3,000	712.5	11.0	-------	42	5.51	-------	-------	
4:28	3,144	701.5	10.4	0.42	44	5.55	-------	-------	
4:31	3,772	650.3	6.6	0.61	50	4.87	-------	-------	
4:32	3,942	636.9	5.6	0.59	55	5.00	-------	-------	
	4,000	631.7	5.3	-------	54	4.81	-------	-------	
4:33	4,066	627.4	5.0	0.48	53	4.62	-------	-------	
4:35	4,621	586.0	2.0	0.54	64	4.51	-------	-------	
	5,000	559.0	−1.1	-------	66	3.68	-------	-------	
4:37	5,093	552.5	−1.9	0.83	66	3.45	-------	-------	
4:38	5,536	522.7	−1.6	−0.07	41	2.20	-------	-------	
	6,000	492.9	−4.5	-------	38	1.60	-------	-------	
	7,000	432.4	−10.6	-------	32	0.79	-------	-------	
4:48	7,925	384.1	−16.4	0.62	26	0.38	-------	-------	
	8,000	379.5	−17.0	-------	27	0.38	-------	-------	
	9,000	332.4	−24.4	-------	34	0.23	-------	-------	
4:54	9,442	312.7	−27.7	0.74	38	0.19	-------	-------	
	10,000	289.2	−31.6	-------	38	0.12	-------	-------	
	11,000	250.1	−38.6	-------	39	0.06	-------	-------	
4:59	11,048	248.9	−39.0	0.70	39.	0.06	-------	-------	

SEPTEMBER 12, 1930

4:09	225	981.1	28.8	-------	61	24.18	sw.	1.4	1 Cu. SW.
	500	950.0	26.5	-------	-----	------	sw.	2.8	
4:11	827	916.5	23.7	0.85	-----	------	sw.	4.0	
	1,000	897.0	22.2	-------	-----	------	sw.	4.2	
	1,500	847.5	17.9	-------	-----	------	sw.	3.8	
4:14	1,512	846.8	17.8	0.86	-----	------	sw.	3.8	
	2,000	799.5	15.5	-------	-----	------	w.	2.3	
4:19	2,408	762.1	13.5	0.48	-----	------	nw.	3.3	
	2,500	752.8	12.9	-------	-----	------	nw.	3.3	
	3,000	708.2	9.8	-------	-----	------	nnw.	1.5	
4:22	3,071	704.0	9.4	0.62	-----	------	nnw.	1.6	
4:24	3,486	669.6	8.1	0.31	-----	------	wnw.	2.4	
	4,000	629.5	4.7	-------	-----	------	w.	5.5	
4:30	4,930	560.6	−1.4	0.66	-----	------	w.	6.5	
	5,000	555.0	−1.3	-------	-----	------	w.	5.5	
4:32	5,194	542.3	−1.2	−0.08	-----	------	w.	5.4	
	6,000	489.3	−6.3	-------	-----	------	wnw.	6.2	
4:37	6,535	457.2	−9.7	0.63	-----	------	w.	10.3	
	7,000	429.9	−12.8	-------	-----	------	w.	12.6	
4:42	7,926	380.7	−18.9	0.66	-----	------	w.	12.5	
	8,000	376.8	−19.5	-------	-----	------	w.	12.2	
4:44	8,265	363.7	−21.7	0.83	-----	------	w.	11.3	
4:45	8,351	359.5	−21.5	−0.23	-----	------	w.	11.0	
	9,000	328.5	−24.1	-------	-----	------	w.	14.2	
4:48	9,383	312.2	−25.6	0.40	-----	------	wsw.	12.6	
	10,000	286.5	−30.5	-------	-----	------	wsw.	16.8	
	11,000	248.7	−38.5	-------	-----	------	w.	24.0	
4:54	11,104	244.7	−39.3	0.80	-----	------	wsw.	23.8	
	12,000	214.4	−45.0	-------	-----	------	w.	23.5	
4:59	12,574	196.7	−48.6	0.63	-----	------	wsw.	21.2	
	13,000	184.0	−51.6	-------	-----	------	wsw.	23.0	
	14,000	157.5	−58.5	-------	-----	------	sw.	22.5	
5:04	14,186	153.1	−59.8	0.69	-----	------	sw.	20.0	
5:06	14,615	142.9	−62.5	0.63	-----	------	-------	-------	Tropopause.
	15,000	134.3	−63.4	-------	-----	------	-------	-------	
	16,000	114.2	−65.6	-------	-----	------	-------	-------	
5:12	16,078	112.6	−65.8	0.23	-----	------	-------	-------	
5:17	16,798	100.2	−61.1	−0.65	-----	------	-------	-------	
	17,000	96.8	−61.7	-------	-----	------	-------	-------	
5:18	17,409	90.8	−62.9	0.29	-----	------	-------	-------	
	18,000	82.3	−62.0	-------	-----	------	-------	-------	
	19,000	70.1	−60.4	-------	-----	------	-------	-------	
5:24	19,028	70.0	−60.4	−0.15	-----	------	-------	-------	

SEPTEMBER 13, 1930

4:02	225	981.2	30.7	-------	47	20.78	s.	3.6	Few Ci. St., W.
	500	951.8	28.3	-------	51	19.64	s.	4.4	
	1,000	899.5	24.0	-------	58	17.32	sw.	5.2	
	1,500	849.0	19.7	-------	66	15.15	w.	6.2	
4:07	1,596	839.3	18.9	0.86	67	14.64	w.	6.3	
4:08	1,832	816.6	17.3	0.68	74	14.62	w.	6.8	
4:09	1,940	806.3	17.5	−0.19	54	10.81	w.	7.1	
	2,000	801.0	17.3	-------	53	10.47	w.	7.2	
4:11	2,256	777.0	16.3	0.38	50	9.27	w.	7.8	
	2,500	756.0	14.9	-------	54	9.15	w.	8.3	
4:14	2,665	740.4	14.0	0.56	57	9.11	w.	7.7	
	3,000	711.1	12.5	-------	45	6.52	wsw.	7.5	
4:16	3,079	704.7	12.2	0.43	42	5.97	wsw.	7.8	
4:20	3,741	650.8	7.3	0.74	41	4.19	wsw.	9.4	

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 13, 1930—Continued

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	*M.*	*Mb.*	°*C.*		*P.ct.*	*Mb.*		*M.b.s.*	
4:21	3,935	635.6	5.2	1.08	48	4.24	w.	9.5	
	4,000	630.6	4.8		47	4.04	w.	9.5	
	5,000	557.2	−1.0		27	1.52	w.	14.2	
4:30	5,278	538.0	−2.6	0.58	22	1.08	w.	14.5	
	6,000	490.9	−7.7		19	0.61	wnw.	17.7	
4:37	6,325	470.7	−10.0	0.71	18	0.47	w.	15.3	
	7,000	430.8	−15.1				w.	17.0	
4:43	7,504	403.0	−18.9	0.75			w.	18.1	
	8,000	377.0	−23.3				w.	20.0	
4:50	8,386	357.3	−26.7	0.88			w.	20.4	
	9,000	328.3	−31.2				w.	26.8	
4:57	9,497	305.6	−34.9	0.74			w.	22.2	
	10,000	284.4	−38.8				w.	23.0	
5:05	10,828	251.6	−45.2	0.77					
	11,000	245.2	−46.6						
5:12	11,855	215.2	−53.3	0.79					
	12,000	210.8	−53.2						
5:18	12,740	187.6	−52.7	−0.07					
	13,000	180.2	−53.9						
	14,000	154.0	−58.4						
5:25	14,183	149.6	−59.2	0.45					Tropopause.
	15,000	131.2	−59.9						
5:31	15,165	127.9	−60.1	0.09					
5:38	15,893	113.9	−58.9	−0.16					

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4:18	225	981.5	23.5		72	20.87	s.	2.4	5 Cl. St., W. 2 A. St., WSW. 2 St. Cu., W.
	500	950.4	21.7				sw.	7.5	
4:19	607	939.2	21.0	0.65			sw.	8.2	
4:20	849	913.5	21.7	−0.29			wsw.	10.8	
	1,000	897.5	20.9				w.	12.0	
	1,500	846.8	18.1				w.	19.6	
	2,000	799.0	15.3				w.	12.4	
4:25	2,259	774.8	13.9	0.55			wsw.	12.2	
	2,500	752.8	12.2				wsw.	13.0	
	3,000	705.0	8.8				w.	18.0	
4:29	3,459	670.8	5.6	0.69			wsw.	23.6	
	4,000	627.4	1.4				wsw.	26.6	
	5,000	552.9	−6.2				wsw.	29.2	
4:35	5,060	549.3	−6.7	0.77			wsw.	29.1	Altitude of A. St. base, 5,150 M. m. s. l.
	6,000	485.0	−11.9						
	7,000	425.0	−17.4						
4:42	7,690	388.6	−21.2	0.55					
	8,000	372.1	−23.6						
	9,000	324.2	−31.4						
	10,000	280.9	−39.2						
4:48	10,229	271.8	−41.0	0.78					
	11,000	241.2	−46.5						
	12,000	207.0	−53.6						
	13,000	177.3	−60.8						
4:57	13,071	175.7	−61.3	0.71					Tropopause.
	14,000	151.9	−62.5						
	15,000	129.3	−63.7						
5:05	15,495	118.7	−64.3	0.12					

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A. m.									
6:16	225	984.1	18.4		99	20.96	sw.	2.4	10 St., SW. Misting. Balloon entered clouds 40 seconds after launching.
	500	952.7	17.0		98	18.99			
	1,000	899.2	14.4		96	15.75			
6:19	1,113	886.8	13.8	0.52	96	15.15			
	1,500	847.0	12.6		78	11.38			
6:22	1,878	809.5	11.5	0.30	60	8.14			
	2,000	798.0	10.9		61	7.95			
	2,500	751.0	8.3		64	7.01			
6:26	2,880	717.4	6.4	0.51	66	6.34			
	3,000	707.1	5.5		73	6.59			
6:27	3,420	671.4	2.2	0.78	98	7.02			
	4,000	623.8	−1.4		99	5.39			
6:31	4,610	578.5	−5.1	0.61	100	4.00			
6:32	4,758	567.8	−4.8	−0.20	88	3.61			
	5,000	550.0	−5.3		67	2.63			
6:33	5,077	545.1	−5.5	0.22	60	2.32			
	6,000	484.1	−9.0		47	1.34			
6:40	6,227	470.3	−9.8	0.37	44	1.17			
6:41	6,709	441.6	−14.2	0.91	53	0.95			
	7,000	424.3	−16.4		56	0.82			
	8,000	371.1	−24.0		65	0.46			
6:48	8,262	358.3	−26.0	0.76	68	0.39			
	9,000	323.2	−31.2		61	0.21			
6:56	9,961	281.9	−38.0	0.71	52	0.08			
	10,000	280.4	−38.3		52	0.08			
	11,000	242.1	−46.8		45	0.03			
7:02	11,162	236.0	−48.2	0.85	44	0.02			
	12,000	207.9	−55.7		43	0.01			

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 15, 1930—Continued

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
A. m.	*M.*	*Mb.*	°*C.*		*P.ct.*	*Mb.*		*M.p.s.*	
7:08	12,472	192.5	−60.0	0.90	42	(1)			
	13,000	177.1	−64.4		42	(1)			
7:11	13,248	169.7	−66.5	0.84	42	(1)			Tropopause.
7:13	13,714	157.2	−65.4	−0.24	42	(1)			
7:14	13,888	152.8	−65.4	0.00	43	(1)			

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6:20	225	983.8	15.0		98	16.72	nw.	0.4	5 A. St., SW., 4 A. Cu., SW.
6:21	312	973.8	13.9	1.26	82	13.03	nw.	3.4	
	500	953.4	15.1		66	11.33	nw.	3.4	
6:22	570	944.5	15.5	−0.62	60	10.57	nw.	3.6	
6:24	941	903.9	12.9	0.70	64	9.52	nnw.	3.4	
	1,000	898.6	12.9		60	8.93	nw.	3.5	
6:25	1,189	877.6	12.9	0.00	48	7.14	nw.	4.1	
	1,500	845.6	11.0		67	8.23	w.	7.4	
6:27	1,637	831.8	10.2	0.60	75	9.33	w.	8.0	Altitude of A. Cu. base, 4,765 M. m. S. l.
6:28	1,800	815.7	10.0	0.12	68	8.35	w.	7.6	
	2,000	795.9	8.6		72	8.04	w.	5.2	
6:29	2,026	793.7	8.4	0.71	73	8.04	w.	5.1	
6:31	2,272	770.4	7.5	0.37	56	5.81	w.	5.1	
	2,500	748.9	6.1		66	6.21	w.	5.0	
	3,000	704.7	2.9		87	6.54	wsw.	9.2	
6:35	3,205	687.2	1.6	0.63	96	6.59	wsw.	9.6	
6:37	3,543	658.8	−0.2	0.53	90	5.41	w.	8.3	
	4,000	622.0	−3.4		95	4.38	wsw.	10.8	
6:41	4,436	588.6	−6.5	0.71	100	3.55	wsw.	13.8	
	5,000	547.8	−10.1		84	2.18			
	6,000	479.9	−16.4		56	0.82			
6:49	6,088	474.6	−16.9	0.63	54	0.76			
6:50	6,648	440.4	−19.0	0.38	61	0.70			
	7,000	419.4	−22.8		56	0.45			
6:53	7,108	413.8	−24.0	1.09	54	0.38			
6:55	7,408	397.2	−24.0	0.00	54	0.38			
	8,000	365.7	−27.6		58	0.29			
	9,000	318.0	−33.7		65	0.17			
7:02	9,087	314.2	−34.2	0.61	66	0.16			
7:05	9,544	294.3	−36.0	0.39	54	0.11			
	10,000	275.6	−39.1		54	0.08			
	11,000	238.0	−45.8		54	0.04			
7:14	11,675	214.6	−50.3	0.67	54	0.02			

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P. m.									
4:01	225	981.3	25.4		46	14.94	sw.	5.5	7 Cu., W.
	500	949.4	23.0		49	13.77	wsw.	10.9	
	1,000	895.9	18.6		54	11.58	wsw.	13.2	
4:05	1,278	868.7	16.2	0.87	57	10.50	w.	15.1	
	1,500	844.8	14.2		64	10.37	w.	15.8	
	2,000	795.2	9.7		79	9.50			
4:07	2,105	787.1	8.7	0.91	82	9.22			
	2,500	747.6	6.0		87	8.13			
	3,000	703.8	2.5		94	6.87			
4:11	3,289	680.9	0.5	0.69	98	6.20			
4:13	3,583	656.4	0.7	−0.07	53	3.40			
	4,000	622.6	−2.2		52	2.65			
4:15	4,453	588.3	−5.3	0.69	50	1.96			
4:16	4,819	561.6	−4.8	−0.14	37	1.52			
	5,000	548.9	−5.9		36	1.35			
	6,000	483.2	−12.1		28	0.61			
4:22	6,4[illegible]0	454.2	−14.9	0.61	24	0.41			
	7,000	423.2	−18.4		22	0.27			
	8,000	369.4	−24.9		19	0.12			
4:28	8,377	350.5	−27.3	0.65	18	0.09			
	9,000	321.0	−32.1		15	0.05			
4:33	9,8[illegible]0	284.0	−38.8	0.78	12	0.02			
	10,000	278.1	−39.7		12	0.02			
4:36	10,898	243.7	−45.2	0.62	14	0.01			Tropopause.
	11,000	238.9	−45.4		14	0.01			
4:38	11,469	223.7	−46.2	0.18	14	0.01			
	12,000	205.3	−47.5		14	0.01			
	13,000	176.6	−50.0		14	0.01			
4:45	13,554	163.0	−51.3	0.24	14	(1)			
	14,000	151.9	−52.3		14	(1)			
	15,000	130.6	−54.7		14	(1)			
4:50	15,909	113.1	−56.8	0.23	14	(1)			
	16,000	111.7	−56.8		14	(1)			
	17,000	95.4	−57.3		14	(1)			
4:57	18,005	81.3	−57.7	0.04	14	(1)			
	19,000	69.8	−57.8		14	(1)			
	20,000	59.8	−57.9		14	(1)			
5:02	20,447	55.3	−58.0	0.01	14	(1)			
	21,000	50.8	−57.8		14	(1)			
	22,000	43.2	−57.4		14	(1)			
	23,000	37.0	−56.9		14	(1)			
5:07	23,846	32.4	−56.6	−0.04	14	(1)			

[1] Less than 0.01 mb.

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 17, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
A. m.	M.	Mb.	°C.		P.ct.	Mb.		M.p.s.	
6:26	225	990.2	11.0	-------	78	10.24	w.	2.0	Cloudless.
	500	957.6	13.1	-------	62	9.35	wnw.	10.4	
6:27	615	945.3	14.0	−0.77	56	8.95	wnw.	10.9	
	1,000	902.7	10.9	-------	59	7.69	wnw.	11.6	
	1,500	849.8	6.8	-------	62	6.13	wnw.	13.1	
6:30	1,588	840.8	6.1	0.81	63	5.93	wnw.	13.9	
6:31	1,756	823.8	5.6	0.30	53	4.82	wnw.	15.3	
	2,000	799.8	4.5	-------	51	4.29	w.	17.4	
6:32	2,171	782.8	3.7	0.46	49	3.90	w.	18.0	
6:33	2,347	766.1	3.7	0.00	44	3.50	w.	18.5	
	2,500	751.9	3.0	-------	43	3.26	w.	18.4	
	3,000	702.5	0.6	-------	38	2.42	w.	19.7	
6:38	3,949	627.3	−4.0	0.48	30	1.32	w.	19.7	
	4,000	622.4	−4.2	-------	30	1.29	w.	19.9	
	5,000	548.7	−8.2	-------	29	0.89	w.	23.8	
6:41	5,036	546.0	−8.3	0.40	29	0.88	w.	24.2	
	6,000	480.8	−15.7	-------	28	0.44	wnw.	32.2	
6:46	6,254	465.5	−17.7	0.77	28	0.36	wnw.	29.2	
	7,000	420.7	−24.2	-------	27	0.19	-------	-------	
6:50	7,433	396.5	−28.0	0.87	27	0.13	-------	-------	
	8,000	366.6	−32.7	-------	27	0.08	-------	-------	
6:54	8,898	321.8	−40.2	0.83	27	0.03	-------	-------	
[illegible]	9,000	317.1	−41.1	-------	27	0.03	-------	-------	
	10,000	272.9	−49.7	-------	26	0.01	-------	-------	
6:57	10,016	272.3	−49.8	0.86	26	0.01	-------	-------	
7:01	10,975	235.1	−51.9	0.22	25	0.01	-------	-------	
	11,000	234.3	−52.1	-------	25	0.01	-------	-------	
7:02	11,267	224.7	−54.4	0.86	25	0.01	-------	-------	Tropopause.
	12,000	200.2	−54.9	-------	23	(1)	-------	-------	
7:09	12,663	180.7	−55.4	0.07	22	(1)	-------	-------	
	13,000	171.4	−56.1	-------	22	(1)	-------	-------	
	14,000	146.8	−58.3	-------	22	(1)	-------	-------	
7:16	14,075	144.7	−58.5	0.22	22	(1)	-------	-------	
	15,000	124.7	−59.4	-------	21	(1)	-------	-------	
7:23	15,148	122.0	−59.6	0.10	21	(1)	-------	-------	

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Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.									
4:14	225	990.0	21.6	-------	28	7.23	w.	6.7	1 Ci., W.
	500	958.1	18.8	-------	28	6.08	w.	10.2	
4:16	751	931.0	16.2	1.03	28	5.16	w.	12.9	
	1,000	903.5	13.9	-------	30	4.77	w.	11.6	
	1,500	850.4	9.2	-------	35	4.07	w.	12.0	
	2,000	801.0	4.5	-------	40	3.37	wnw.	12.7	
4:21	2,098	791.6	3.6	0.94	41	3.24	wnw.	13.1	
4:22	2,383	764.2	2.4	0.42	37	2.69	wnw.	14.9	
	2,500	752.5	2.5	-------	32	2.34	wnw.	15.1	
4:23	2,564	747.3	2.6	−0.11	29	2.13	wnw.	15.2	
	3,000	708.2	1.3	-------	25	1.68	wnw.	19.4	
4:27	3,321	680.2	0.3	0.30	22	1.37	wnw.	22.4	
	4,000	624.9	−2.2	-------	28	1.43	wnw.	23.1	
4:29	4,089	617.8	−2.5	0.36	29	1.44	wnw.	23.8	
	5,000	550.1	−7.5	-------	32	1.04	wnw.	25.9	
4:33	5,165	538.7	−8.4	0.55	33	0.99	wnw.	25.1	
	6,000	484.3	−14.0	-------	38	0.70	w.	30.5	
4:38	6,434	456.3	−16.9	0.67	41	0.57	w.	29.5	
	7,000	423.8	−21.2	-------	41	0.38	w.	33.2	
4:44	7,869	375.4	−27.9	0.77	41	0.20	w.	32.5	
	8,000	369.1	−28.9	-------	41	0.18	w.	32.3	
	9,000	320.7	−36.2	-------	39	0.08	w.	46.8	
4:49	9,753	286.7	−41.7	0.73	38	0.04	-------	-------	
	10,000	276.6	−43.3	-------	37	0.03	-------	-------	
4:54	11,004	237.7	−49.9	0.66	34	0.01	-------	-------	
4:57	11,766	211.4	−53.8	0.51	32	0.01	-------	-------	Tropopause.
	12,000	203.8	−54.1	-------	32	0.01	-------	-------	
	13,000	174.0	−55.5	-------	32	0.01	-------	-------	
5:06	13,546	160.1	−56.3	0.14	32	0.01	-------	-------	
	14,000	149.0	−58.0	-------	32	(1)	-------	-------	
5:15	15,000	126.9	−61.9	-------	32	(1)	-------	-------	
	15,141	124.2	−62.4	0.38	32	(1)	-------	-------	

SEPTEMBER 18, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
A. m.									
6:33	225	995.2	10.8	-------	82	10.62	s.	2.0	Few Ci., W.
6:34	307	985.5	17.2	−7.80	55	10.80	ssw.	3.6	
	500	963.6	16.2	-------	53	9.76	wsw.	5.4	
6:36	896	919.4	14.1	0.53	50	8.04	w.	5.6	
	1,000	908.4	13.4	-------	51	7.84	w.	6.0	
6:37	1,382	867.6	10.8	0.68	53	6.86	wnw.	8.1	
	1,500	856.3	10.0	-------	56	6.88	wnw.	8.2	
	2,000	805.1	6.4	-------	67	6.44	nw.	10.1	
6:40	2,215	784.2	4.9	0.71	72	6.24	nw.	11.2	
	2,500	756.8	5.0	-------	61	5.32	nw.	10.2	
6:42	2,724	736.7	5.1	−0.04	53	4.65	nw.	10.4	
	3,000	711.4	4.1	-------	50	4.10	wnw.	13.1	
6:44	3,593	662.0	2.0	0.36	43	3.03	nw.	11.0	
	4,000	630.2	−0.6	-------	41	2.38	nw.	8.1	
	5,000	554.7	−7.1	-------	37	1.25	nw.	9.5	

[1] Less than 0.01 mb.

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 18, 1930—Continued

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
A. m.	M.	Mb.	°C.		P.ct.	Mb.		M.p.s.	
6:50	5,476	521.5	−10.2	0.35	35	0.90	nw.	8.7	
	6,000	486.0	−13.9	-------	34	0.63	nw.	8.5	
	7,000	425.3	−21.1	-------	33	0.31	nw.	9.6	
6:57	7,176	416.2	−22.3	0.59	33	0.28	nw.	9.7	
	8,000	371.0	−31.1	-------	32	0.11	nnw.	10.9	
7:01	8,386	351.6	−35.3	1.07	31	0.07	nw.	9.8	
	9,000	321.1	−39.8	-------	32	0.04	wnw.	10.3	
	10,000	277.5	−47.0	-------	34	0.02	w.	21.4	
7:07	10,447	259.2	−50.3	0.73	35	0.01	w.	23.6	
	11,000	237.8	−52.6	-------	34	0.01	wsw.	33.2	
	12,000	203.4	−56.8	-------	33	0.01	wsw.	33.3	
7:12	12,024	202.9	−56.9	0.42	33	0.01	w.	33.0	Tropopause.
7:15	12,729	181.5	−57.8	0.13	35	(1)	wsw.	26.0	
	13,000	174.6	−58.3	-------	35	(1)	wsw.	28.7	
	14,000	147.9	−60.0	-------	34	(1)	-------	-------	
7:22	14,486	137.2	−60.9	0.18	33	(1)	-------	-------	
	15,000	126.1	−60.5	-------	31	(1)	-------	-------	
7:29	15,783	111.5	−59.8	−0.08	28	(1)	-------	-------	

SEPTEMBER 18, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.									
4:01	225	991.4	25.5	-------	38	12.41	sw.	2.7	Few Ci., few A. Cu.
-------	500	959.9	22.6	-------	41	11.25	ssw.	5.1	
-------	1,000	906.0	17.4	-------	47	9.34	ssw.	6.8	
4:04	1,038	902.4	17.0	1.05	47	9.11	sw.	6.8	
-------	1,500	853.6	13.1	-------	53	7.99	sw.	6.9	
4:06	1,861	818.3	10.0	0.85	58	7.12	wsw.	7.3	
4:07	1,998	804.9	9.7	0.22	60	7.22	w.	8.8	
4:08	2,426	764.3	7.5	0.51	68	7.05	nw.	9.4	
-------	2,500	758.1	7.7	-------	64	6.73	nw.	9.5	
4:09	2,620	746.5	8.0	−0.26	58	6.22	nnw.	10.1	
4:10	2,803	730.1	6.8	0.66	62	6.13	nnw.	13.1	
-------	3,000	712.2	6.0	-------	55	5.14	nnw.	13.9	
4:12	3,283	688.5	4.9	0.40	45	3.90	nnw.	12.0	
4:14	3,851	641.9	1.3	0.63	48	3.22	nnw.	7.8	
-------	4,000	630.4	0.5	-------	45	2.85	nw.	7.4	
4:17	4,739	574.3	−3.2	0.51	30	1.41	w.	5.9	
-------	5,000	555.4	−4.1	-------	27	1.17	wsw.	5.4	
4:19	5,207	541.2	−4.9	0.36	25	1.02	wsw.	5.2	
-------	6,000	488.3	−12.2	-------	25	0.54	w.	8.0	
4:27	6,967	429.7	−21.2	0.93	24	0.22	w.	8.7	
-------	7,000	427.4	−21.5	-------	24	0.22	w.	8.7	
-------	8,000	372.8	−31.0	-------	24	0.08	wnw.	12.3	
4:33	8,386	352.8	−34.6	0.94	24	0.06	wnw.	12.3	
-------	9,000	322.6	−41.8	-------	24	0.02	w.	11.4	
4:40	9,649	292.9	−49.5	1.18	24	0.01	wsw.	12.1	
-------	10,000	277.3	−50.3	-------	24	0.01	wsw.	17.0	
-------	11,000	248.5	−52.7	-------	23	0.01	sw.	24.7	
4:47	11,509	220.0	−53.9	0.24	22	0.01	wsw.	38.8	
-------	12,000	204.3	−55.9	-------	22	(1)	sw.	34.0	
4:53	12,534	187.3	−58.1	0.41	22	(1)	wsw.	36.2	Tropopause.
-------	13,000	174.4	−58.8	-------	22	(1)	wsw.	34.6	
4:59	13,733	154.8	−59.8	0.14	22	(1)	wsw.	29.3	
-------	14,000	148.3	−60.0	-------	22	(1)	w.	30.7	
5:04	14,946	127.5	−60.5	0.06	22	(1)	wsw.	26.7	
-------	15,000	126.2	−60.8	-------	22	(1)	wsw.	26.9	
5:05	15,298	120.5	−62.7	0.62	20	(1)	wsw.	21.3	

SEPTEMBER 19, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100\text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
A. m.									
6:33	225	991.4	16.1	-------	69	12.63	s.	3.1	6 A. Cu., W.
6:33½	345	977.5	15.2	0.75	67	11.58	s.	8.4	
6:34	478	962.3	18.1	−2.18	53	11.01	ssw.	10.8	
-------	500	958.9	18.1	-------	53	11.01	ssw.	11.2	
6:35	663	941.7	18.5	−0.22	53	11.29	sw.	11.5	
6:35½	865	919.8	19.4	−0.45	48	10.82	sw.	11.8	
-------	1,000	905.0	18.8	-------	49	10.64	sw.	11.4	
-------	1,500	853.2	16.5	-------	52	9.77	wsw.	9.3	
-------	2,000	805.5	14.2	-------	56	9.07	wsw.	7.5	
6:40	2,008	804.3	14.2	0.45	56	9.07	wsw.	7.5	
-------	2,500	760.0	10.0	-------	58	7.12	w.	8.2	
-------	3,000	715.0	5.8	-------	60	5.53	wnw.	10.4	
6:45	3,627	660.8	0.5	0.85	62	3.92	wnw.	9.1	
-------	4,000	631.1	−2.4	-------	65	3.26	w.	11.0	
-------	5,000	554.5	−10.3	-------	73	1.86	w.	8.2	
6:51	5,189	541.7	−11.8	0.79	75	1.67	-------	-------	
6:52	5,444	524.0	−10.1	−0.67	70	1.82	-------	-------	
-------	6,000	487.3	−13.5	-------	62	1.19	-------	-------	
6:58	6,916	431.7	−19.2	0.62	48	0.54	-------	-------	
-------	7,000	427.3	−19.6	-------	48	0.52	-------	-------	
-------	8,000	372.8	−24.8	-------	48	0.31	-------	-------	
7:06	8,770	335.0	−28.7	0.51	48	0.21	-------	-------	
-------	9,000	324.9	−30.6	-------	48	0.17	-------	-------	
-------	10,000	281.7	−39.0	-------	47	0.07	-------	-------	
-------	11,000	242.7	−47.3	-------	46	0.02	-------	-------	
7:14	11,027	241.5	−47.5	0.83	46	0.02	-------	-------	

[1] Less than 0.01 mb.

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*

SEPTEMBER 19, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100 \text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	M.	Mb.	°C.		P. ct.	Mb.		M.p.s.	
4:10	225	987.4	27.4	-------	38	13.88	s.	5.4	1 A. Cu., SW.
	500	955.8	24.8	-------	-----	------	ssw.	11.1	
4:12	726	932.2	22.6	0.96	-----	------	ssw.	11.4	
4:13	943	909.1	21.5	0.51	-----	------	sw.	16.4	
	1,000	902.9	21.0	-------	-----	------	sw.	16.8	
4:14	1,366	865.2	17.5	0.95	-----	------	sw.	16.4	
4:15	1,467	855.0	17.8	−0.30	-----	------	sw.	15.0	
	1,500	852.2	17.5	-------	-----	------	wsw.	14.3	
4:16	1,792	822.9	15.3	0.77	-----	------	wsw.	16.1	
	2,000	803.5	14.0	-------	-----	------	wsw.	16.6	
	2,500	756.2	10.8	-------	-----	------	wsw.	15.4	
4:19	2,818	727.7	8.8	0.63	-----	------	wsw.	14.6	
4:20	2,920	718.8	9.2	−0.39	-----	------	wsw.	14.7	
	3,000	712.8	8.5	-------	-----	------	w.	14.9	
4:21	3,272	688.7	6.1	0.88	-----	------	w.	15.0	
	4,000	629.7	−0.6	-------	-----	------	w.	10.2	
4:25	4,278	607.8	−3.1	0.91	-----	------	w.	10.0	
	5,000	554.5	−8.1	-------	-----	------	nw.	10.3	
4:30	5,513	518.7	−11.6	0.69	-----	------	wnw.	8.7	
	6,000	486.9	−14.1	-------	-----	------	w.	11.5	
4:36	6,728	441.9	−17.9	0.52	-----	------	w.	16.3	
	7,000	426.4	−20.0	-------	-----	------	w.	15.3	
	8,000	372.2	−27.6	-------	-----	------	w.	14.8	
4:42	8,173	362.7	−28.9	0.76	-----	------	wnw.	13.2	
	9,000	323.0	−35.7	-------	-----	------	wnw.	9.8	
4:49	9,874	284.1	−42.9	0.82	-----	------	w.	17.4	
	10,000	279.1	−43.5	-------	-----	------	w.	17.8	
	11,000	240.2	−48.5	-------	-----	------	w.	22.2	
4:56	11,433	224.7	−50.6	0.49	-----	------	wsw.	26.8	
	12,000	205.7	−54.4	-------	-----	------	w.	25.4	
4:59	12,552	188.7	−58.0	0.66	-----	------	wsw.	30.0	Tropopause.
	13,000	175.9	−58.1	-------	-----	------	wsw.	36.0	
	14,000	150.0	−58.2	-------	-----	------	wsw.	38.3	
5:08	14,444	139.8	−58.3	0.02	-----	------	w.	27.6	
	15,000	-------	-------	-------	-----	------	w.	24.7	
5:13	15,519	-------	-------	-------	-----	------	wsw.	24.0	

SEPTEMBER 20, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100 \text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
A. m.									
6:34	225	991.7	13.0	-------	79	11.83	n.	2.8	7 St. Cu., W.
6:35	394	971.9	13.0	0.00	72	10.79	n.	7.0	
	500	959.6	12.3	-------	72	10.30	n.	8.6	
6:36	884	916.7	9.9	0.63	72	8.78	n.	11.2	
	1,000	903.0	10.9	-------	72	9.39	n.	8.6	
6:36½	1,022	901.7	11.1	−0.87	72	9.51	n.	8.3	
6:37	1,184	884.3	10.4	0.43	82	10.34	nnw.	6.1	
6:38	1,359	865.9	10.9	−0.29	84	10.95	w.	6.8	
	1,500	850.4	11.8	-------	85	11.76	w.	8.5	
6:39	1,663	835.1	12.8	−0.63	86	12.71	wsw.	12.9	
	2,000	802.0	11.2	-------	86	11.44	w.	15.4	
6:42	2,500	755.5	8.7	0.49	86	9.68	w.	18.8	
	3,000	710.1	5.2	-------	86	7.60	-------	-------	
6:45	3,623	658.3	0.8	0.70	86	5.56	-------	-------	
6:46	3,868	638.8	1.8	−0.41	70	4.86	-------	-------	
	4,000	627.5	0.9	-------	71	4.63	-------	-------	
6:48	4,792	568.9	−4.7	0.70	74	3.06	-------	-------	
	5,000	554.4	−6.4	-------	77	2.76	-------	-------	
6:50	5,215	538.9	−8.2	0.83	80	2.46	-------	-------	
6:51	5,747	503.2	−10.6	0.45	60	1.49	-------	-------	
	6,000	486.9	−12.3	-------	60	1.28	-------	-------	
6:53	6,545	453.2	−16.1	0.69	60	0.91	-------	-------	
	7,000	426.5	−18.5	-------	58	0.70	-------	-------	
6:55	7,281	410.8	−20.0	0.53	56	0.58	-------	-------	
6:57	7,696	388.3	−23.8	0.92	54	0.39	-------	-------	
	8,000	372.7	−25.7	-------	52	0.31	-------	-------	
	9,000	324.5	−32.0	-------	47	0.15	-------	-------	
7:05	9,470	303.0	−35.0	0.63	45	0.10	-------	-------	
7:08	9,993	280.9	−40.3	1.01	43	0.05	-------	-------	
7:10	10,377	265.5	−41.5	0.31	43	0.05	-------	-------	
	11,000	241.9	−48.1	-------	43	0.02	-------	-------	
7:14	11,271	232.1	−51.0	1.06	43	0.02	-------	-------	

SEPTEMBER 20, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100 \text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.									
4:10	225	969.9	20.7	-------	31	7.57	nw.	3.6	2 Cl. St., W.
	500	958.5	18.3	-------	-----	------	w.	3.8	
4:12	779	927.5	15.8	0.88	-----	------	wnw.	4.1	Pressure record poor; altitutudes determined from 2-theodolite observations; pressures computed from altitudes and temperatures.
	1,000	904.0	13.9	-------	-----	------	wnw.	4.9	
4:15	1,457	855.3	10.1	0.84	-----	------	wnw.	6.7	
	1,500	851.4	9.9	-------	-----	------	wnw.	6.9	
	2,000	800.0	7.5	-------	-----	------	w.	8.6	
4:17	2,222	779.4	6.4	0.48	-----	------	w.	11.1	
4:18	2,399	762.7	7.5	−0.62	-----	------	w.	12.0	
	2,500	753.5	6.8	-------	-----	------	w.	12.3	
4:20	2,757	730.1	5.0	0.70	-----	------	w.	13.1	

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 20, 1930—Continued

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100 \text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	M.	Mb.	°C.		P. ct.	Mb.		M.p.s.	
4:21	2,950	713.0	5.2	−0.10	-----	------	w.	14.5	
	3,000	709.1	4.9	-------	-----	------	w.	14.9	
4:24	3,921	632.2	0.1	0.52	-----	------	w.	18.6	
	4,000	626.0	−0.4	-------	-----	------	w.	18.7	
4:28	4,889	559.4	−6.1	0.64	-----	------	w.	21.0	
	5,000	550.9	−6.0	-------	-----	------	w.	20.9	
4:29	5,133	542.3	−5.9	−0.08	-----	------	w.	20.1	
	6,000	485.0	−13.6	-------	-----	------	w.	23.8	
4:35	6,340	463.5	−16.6	0.89	-----	------	w.	25.5	
4:36	6,709	-------	-------	-------	-----	------	w.	24.5	

SEPTEMBER 21, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100 \text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
4:27	225	986.5	23.1	-------	35	9.90	s.	3.6	Cloudless.
4:28	437	962.8	23.1	0.00	34	9.62	ssw.	8.3	
	500	954.8	22.6	-------	34	9.33	ssw.	8.5	
	1,000	900.7	18.3	-------	36	7.57	ssw.	10.8	
4:31	1,443	856.1	14.6	0.85	38	6.32	sw.	12.2	
	1,500	850.0	14.6	-------	39	6.48	sw.	12.4	
4:32	1,678	832.7	14.5	0.41	41	6.77	wsw.	13.3	
4:33	1,945	806.7	13.5	0.37	46	7.12	w.	15.5	
	2,000	800.9	13.7	-------	45	7.06	w.	16.1	
4:34	2,079	794.0	13.9	−0.30	44	6.99	w.	17.0	
	2,500	755.0	10.6	-------	48	6.13	wnw.	19.6	
	3,000	710.9	6.7	-------	53	5.20	wnw.	24.4	
4:38	3,368	679.7	3.9	0.78	57	4.60	wnw.	23.4	
4:39	3,563	663.6	4.1	−0.10	52	4.26	w.	21.9	
	4,000	628.5	0.7	-------	52	3.34	w.	22.4	
4:42	4,668	578.1	−4.5	0.78	52	2.19	w.	27.3	
4:43	4,856	564.4	−4.3	−0.11	50	2.14	w.	28.8	
	5,000	554.0	−5.2	-------	48	1.91	w.	29.3	
4:46	5,671	508.5	−9.2	0.60	41	1.15	w.	28.2	
4:47	5,884	494.7	−8.9	−0.14	38	1.09	wnw.	26.8	
	6,000	486.4	−9.9	-------	38	1.00	wnw.	25.2	
4:49	6,406	462.2	−13.6	0.90	38	0.72	w.	29.4	
	7,000	425.7	−18.6	-------	37	0.44	w.	29.4	
	8,000	372.8	−27.0	-------	34	0.18	w.	32.3	
4:53	8,216	361.8	−28.8	0.84	34	0.15	w.	35.2	
	9,000	325.9	−35.6	-------	33	0.07	w.	39.4	
4:59	9,717	291.8	−41.9	0.87	33	0.03	w.	33.8	
	10,000	282.9	−44.0	-------	33	0.03	w.	34.7	
	11,000	241.0	−51.5	-------	33	0.01	w.	33.6	
5:04	11,057	238.5	−51.9	0.75	33	0.01	-------	-------	

SEPTEMBER 24, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	$\frac{\Delta t}{100 \text{ m.}}$	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
3:58	225	989.0	23.9	-------	77	22.85	s.	4.5	6 A. St., SW 4 St., SW.
3:59	316	978.8	23.5	0.44	-----	------	ssw.	8.1	
	500	958.9	22.6	-------	-----	------	ssw.	11.2	
4:00	599	947.6	22.1	0.49	-----	------	ssw.	12.1	
	1,000	905.4	19.7	-------	-----	------	sw.	17.3	
4:04	1,458	857.7	16.9	0.61	-----	------	sw.	20.0	
	1,500	854.0	16.7	-------	-----	------	sw.	19.9	
	2,000	805.0	13.9	-------	-----	------	sw.	22.0	
4:07	2,262	780.0	12.4	0.56	-----	------	sw.	21.8	
	2,500	758.5	11.0	-------	-----	------	sw.	21.4	
	3,000	715.0	8.1	-------	-----	------	sw.	20.6	
4:11	3,137	702.2	7.3	0.58	-----	------	sw.	20.1	
4:14	3,932	637.0	2.6	0.59	-----	------	-------	-------	
	4,000	632.1	2.4	-------	-----	------	-------	-------	
	5,000	558.1	−1.0	-------	-----	------	-------	-------	Intermittent showers all day; Sprinkling rain at time of flight.
4:18	5,165	546.5	−1.6	0.34	-----	------	-------	-------	
	6,000	492.2	−7.5	-------	-----	------	-------	-------	
4:24	6,474	462.4	−10.8	0.70	-----	------	-------	-------	
	7,000	431.3	−14.0	-------	-----	------	-------	-------	
	8,000	377.1	−20.0	-------	-----	------	-------	-------	
4:32	8,212	367.3	−21.3	0.60	-----	------	-------	-------	
	9,000	330.0	−27.1	-------	-----	------	-------	-------	
4:38	9,548	305.5	−31.1	0.73	-----	------	-------	-------	
	10,000	287.2	−34.7	-------	-----	------	-------	-------	
4:45	10,869	252.6	−41.8	0.81	-----	------	-------	-------	
	11,000	247.9	−43.0	-------	-----	------	-------	-------	
4:51	11,795	219.8	−50.2	0.91	-----	------	-------	-------	
	12,000	213.0	−52.1	-------	-----	------	-------	-------	
4:56	12,650	192.4	−58.2	0.94	-----	------	-------	-------	
	13,000	181.9	−60.5	-------	-----	------	-------	-------	
5:03	13,479	168.4	−63.7	0.66	-----	------	-------	-------	
	14,000	154.8	−67.4	-------	-----	------	-------	-------	
5:10	14,357	145.7	−69.9	0.71	-----	------	-------	-------	Tropopause.
	15,000	130.9	−66.7	-------	-----	------	-------	-------	
5:16	15,020	130.5	−66.6	−0.50	-----	------	-------	-------	
5:21	15,461	121.4	−64.0	−0.59	-----	------	-------	-------	

TABLE 2.—*Tabulated data of sounding-baloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 26, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	Δt 100 m.	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	*M.*	*Mb.*	°*C.*		*P. ct.*	*Mb.*		*M.p.s.*	
4:02	225	980.7	11.2	-------	69	9.18	w.	9.4	10 St. Cu., WSW.
4:03	411	959.1	11.0	0.11	73	9.58	wsw.	13.5	
	500	953.6	10.2	-------	76	9.45	wsw.	15.7	
	1,000	892.6	5.8	-------	92	8.48	-------	-------	Base of St. Cu.= 867 M. m.s.l.
4:07	1,242	867.0	3.6	0.89	100	7.90	-------	-------	
	1,500	839.3	2.2	-------	99	7.09	-------	-------	
	2,000	788.0	−0.5	-------	98	5.74	-------	-------	
4:15	2,492	742.1	−3.2	0.54	96	4.50	-------	-------	
	2,500	740.8	−3.0	-------	94	4.48	-------	-------	
4:16	2,577	734.2	−1.5	−2.00	79	4.27	-------	-------	
4:18	2,900	705.1	0.0	−0.46	58	3.54	-------	-------	
	3,000	696.0	−0.5	-------	58	3.40	-------	-------	
4:22	3,638	642.7	−3.5	0.47	56	2.56	-------	-------	
4:23	3,808	629.0	−1.8	−1.00	43	2.27	-------	-------	
	4,000	614.5	−2.0	-------	41	2.12	-------	-------	
4:27	4,461	579.4	−2.6	0.12	37	1.82	-------	-------	
	5,000	542.1	−4.1	-------	28	1.22	-------	-------	
4:35	5,752	491.9	−6.2	0.28	15	0.55	-------	-------	
	6,000	477.1	−7.8	-------	15	0.48	-------	-------	
	7,000	418.7	−14.4	-------	13	0.23	-------	-------	
4:42	7,211	406.9	−15.8	0.66	13	0.20	-------	-------	
	8,000	366.5	−20.9	-------	12	0.11	-------	-------	
4:49	8,519	341.2	−24.3	0.65	12	0.08	-------	-------	
	9,000	319.4	−28.6	-------	13	0.06	-------	-------	
4:56	9,716	288.6	−35.1	0.90	14	0.03	-------	-------	
	10,000	277.4	−36.8	-------	14	0.03	-------	-------	
5:01	10,710	249.9	−41.0	0.59	14	0.02	-------	-------	
5:02	10,948	241.3	−40.2	−0.34	14	0.02	-------	-------	
	11,000	239.9	−40.6	-------	14	0.02	-------	-------	
	12,000	206.6	−48.4	-------	12	0.01	-------	-------	
5:08	12,236	199.1	−50.4	0.79	12	(1)	-------	-------	Tropopause.
	13,000	177.3	−52.0	-------	12	(1)	-------	-------	
5:16	13,397	166.6	−52.9	0.22	12	(1)	-------	-------	

SEPTEMBER 28, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	Δt 100 m.	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
4:00	225	990.5	17.0	-------	33	6.40	w.	5.7	Cloudless.
	500	957.5	14.5	-------	35	5.78	w.	8.2	
	1,000	923.8	10.1	-------	38	4.70	w.	10.4	
4:03	1,241	877.2	7.9	0.90	40	4.26	w.	11.0	
	1,500	850.0	5.7	-------	43	3.94	w.	10.8	
4:05	1,987	800.5	1.7	0.83	48	3.31	wnw.	15.9	
	2,000	799.5	1.8	-------	47	3.27	wnw.	16.2	
4:06	2,169	782.6	3.4	−0.93	30	2.34	wnw.	18.9	
	2,500	751.0	2.3	-------	47	3.39	nw.	29.6	
4:08	2,510	750.4	2.3	0.32	48	3.46	nw.	29.8	Pressure trace questionable; altitudes determined from 2-theodolite observations; pressure computed from altitudes and temperatures.
4:09	2,902	714.6	−0.2	0.64	57	3.43	nw.	30.6	
	3,000	705.0	−0.6	-------	57	3.31	nw.	30.6	
4:11	3,751	642.2	−4.0	0.45	57	2.50	wnw.	28.2	
	4,000	622.1	−5.0	-------	53	2.14	wnw.	28.8	
4:13	4,353	594.9	−6.4	0.40	48	1.72	wnw.	28.7	
	5,000	547.7	−10.5	-------	40	1.00	wnw.	29.8	
4:17	5,790	493.6	−15.5	0.63	30	0.48	wnw.	25.8	
	6,000	480.9	−17.0	-------	30	0.42	wnw.	21.5	
	7,000	420.4	−24.0	-------	29	0.21	wnw.	23.2	
	8,000	365.3	−31.1	-------	28	0.10	wnw.	30.2	

[1] Less than 0.01 mb.

TABLE 2.—*Tabulated data of sounding-baloon ascents at Royal Center, Ind., during September, 1930*—Continued

SEPTEMBER 28, 1930—Continued

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	Δt 100 m.	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
P. m.	*M.*	*Mb.*	°*C.*		*P. ct.*	*Mb.*		*M.p.s.*	
4:25	8,613	334.7	−35.4	0.70	28	0.06	wnw.	26.8	
	9,000	316.8	−38.5	-------	27	0.04	wnw.	24.7	
	10,000	273.2	−46.5	-------	26	0.02	wnw.	30.7	
4:31	10,503	253.0	−50.5	0.80	25	0.01	wnw.	29.1	
	11,000	234.1	−53.6	-------	25	0.01	w.	26.7	
4:37	11,996	200.4	−59.7	0.62	25	(1)	w.	40.0	Tropopause.
	13,000	171.0	−60.1	-------	25	(1)	w.	31.4	
4:41	13,423	159.6	−60.3	0.04	25	(1)	w.	26.7	
4:42	13,488	-------	-------	-------	-------	-------	w.	26.0	

SEPTEMBER 29, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	Δt 100 m.	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
4:02	225	992.1	17.0	-------	47	9.11	n.	4.2	Few A. Cu., W.
	500	960.0	14.4	-------	51	8.37	nnw.	6.0	
	1,000	905.2	9.7	-------	60	7.22	nnw.	4.3	
4:06	1,261	876.7	7.2	0.95	64	6.50	nw.	7.3	
4:07	1,476	854.1	7.5	−0.14	64	6.64	nw.	10.9	
	1,500	851.5	7.4	-------	64	6.59	nw.	11.1	
	2,000	800.1	5.5	-------	64	5.78	wnw.	17.0	
4:09	2,148	786.9	4.9	0.39	64	5.54	w.	19.3	
	2,500	755.0	3.2	-------	60	4.61	w.	21.6	
4:11	2,539	750.0	3.0	0.48	60	4.55	w.	21.6	
	3,000	709.7	−0.7	-------	68	3.92	wnw.	23.7	
4:15	3,353	677.5	−3.5	0.80	74	3.39	wnw.	25.1	
4:16	3,769	642.7	−4.9	0.34	50	2.04	wnw.	23.0	
4:17	3,923	630.3	−4.5	−0.26	43	1.81	wnw.	23.0	

SEPTEMBER 30, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature	Δt 100 m.	Humidity: Relative	Humidity: Vapor pressure	Wind: Direction	Wind: Velocity	Remarks
4:04	225	997.6	15.3	-------	50	8.70	n.	5.5	Few Ci., NW.
	500	965.0	13.1	-------	53	7.99	n.	6.6	Cu., NW.
	1,000	909.4	9.1	-------	59	6.82	n.	6.4	Pressure trace questionable; altitude determined from 2-theodolite observations; pressure computed from altitudes and temperatures.
	1,500	856.2	5.1	-------	66	5.79	nnw.	5.1	
4:09	1,784	826.4	2.8	0.80	69	5.15	nnw.	4.9	
	2,000	805.0	4.1	-------	54	4.42	nnw.	8.8	
4:11	2,230	782.4	5.5	−0.61	39	3.52	nnw.	11.6	
	2,500	757.0	5.3	-------	33	2.94	nnw.	10.6	
4:11½	2,547	752.6	5.3	0.06	32	2.85	nnw.	10.4	
4:12	2,628	745.2	5.5	−0.25	30	2.71	nnw.	10.5	
4:14	3,002	711.7	5.0	0.13	28	2.44	nnw.	18.4	
	4,000	626.0	−1.3	-------	31	1.70	nw.	18.6	
	5,000	551.1	−7.5	-------	34	1.11	nw.	19.7	
	6,000	486.1	−13.8	-------	37	0.69	nw.	20.2	
4:23	6,337	465.5	−15.9	0.63	38	0.59	nw.	21.4	
	7,000	427.0	−20.5	-------	38	0.38	nw.	20.9	
	8,000	372.5	−27.4	-------	38	0.19	nw.	21.9	
	9,000	323.2	−34.3	-------	38	0.09	nw.	27.6	
4:33	9,531	299.1	−38.0	0.69	38	0.06	nw.	26.7	
	10,000	279.5	−41.4	-------	37	0.04	nw.	25.4	
	11,000	241.6	−48.7	-------	36	0.01	wnw.	28.0	
	12,000	206.6	−56.0	-------	35	0.01	wnw.	32.6	
4:43	12,118	202.4	−56.9	0.73	35	0.01	nw.	32.8	
	13,000	-------	-------	-------	-------	-------	nw.	34.0	
4:48	13,591	-------	-------	-------	-------	-------	nw.	38.0	

[1] Less than 0.01 mb.

RECORD SHORT-PERIOD RAINFALLS IN FLORIDA

GEORGE V. FISH

[Weather Bureau Office, Tampa, Fla.]

The following is a study of record rainfalls for 5, 10, 15, and 30 minutes and for 1, 2, and 24 hours, together with the maximum monthly amounts occurring on or near the coast of Florida, as determined from the data of the first-order Weather Bureau stations in that State.

This subject is important owing to its value to architects, engineers, and all engaged in the aviation industry. They desire to ascertain just what they may expect in the future as inferred from the records of what has happened in the past.

Architects have to consider these values in planning the roofs and foundations of buildings. Engineers consider carefully the amount of run-off they may expect in the season of summer showers. In so far as may be considered justified, they allow a considerable margin for the exceptionally heavy rainfall.

Since an east coast mail pilot was caught in the thunderstorm as reported by James W. Smith (MONTHLY WEATHER REVIEW, vol. 58, March, 1930, pp. 117–118) every commercial pilot in Florida has had an increased respect for these tremendous downpours of rainfall. The tendency of pilots, previous to that time, was to take off with their ship, try to find a "hole" in the thick weather and get the mail through to their destination. Since that time they have made many flights in weather that was far from good, but only after they had received reports assuring them of frequent breaks in the threatening weather confronting them.

The tables show that by far the greater number of these record amounts occurred in connection with thunderstorms. On the west coast of Florida, from Pensacola to Tampa, practically all the record falls occurred in thunderstorms, though the tabulated amounts for Apalachicola indicate that tropical storms may be a factor in that record. The existing short-period records for Apalachicola are comparatively brief. It is believed that