AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE in charge]

By L. T. SAMUELS

At those stations with a sufficient period of record for the determination of approximate normals, upper-air temperatures during May averaged close to normal. (See table 1.) The large negative departures found for Seattle are unreliable, being based on only 6 observations. Upper-air relative humidity departures were in general of opposite sign to those for temperature and of small magnitude.

The directions of the upper-air wind resultants at the 3 km level were close to normal at most stations. (See table 2.) Resultant velocities at that level exceeded the normals over the northern section of the country, and were below normal elsewhere. Departures were of small to moderate magnitude.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during May 1936*

TEMPERATURE (° C.)

Stations	Altitude (meters) m. s. l.																Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Barksdale Field (Shreveport), La.[1] (52 m)	19.0		20.4		17.4		14.3		11.5		8.9		6.4		0.6		−5.6		31
Billings, Mont.[3] (1,088 m)	12.6						14.8		11.8		8.2		4.4		−3.4		−10.9		31
Boston, Mass.[1] (5 m)	12.0	−1.1	12.6	+0.8	10.6	+1.1	7.8	+1.0	5.0	+0.6	2.2	+0.2	−0.5	+0.1	−5.5	+0.3	−11.7	+0.2	30
Cheyenne, Wyo.[2] (1,873 m)	8.7								10.0		8.7		5.4		−2.2		−10.4		29
El Paso, Tex.[2] (1,194 m)	18.7						18.7		16.3		12.9		9.4		1.5		−6.6		31
Fargo, N. Dak.[2] (274 m)	10.9		14.4		13.2		10.8		8.4		5.3		2.1		−3.9		−10.4		31
Kelly Field (San Antonio), Tex.[1] (206 m)	19.8		20.2		18.0		15.9		13.7		11.1		8.4		2.1		−4.5		28
Lakehurst, N. J.[3] (39 m)	12.2		13.3		11.7		9.8		7.7		5.2		3.1		−2.6		−8.9		27
Maxwell Field (Montgomery), Ala.[1] (52 m)	19.4		21.5		19.0		15.4		12.5		9.4		6.9		1.6		−3.7		29
Mitchell Field (Hempstead, L. I.), N. Y.[1] (29 m)	12.1		14.4		13.3		11.4		8.5		5.9		3.4		−2.1				27
Murfreesboro, Tenn.[2] (174 m)	15.5		19.5		17.4		14.4		11.2		8.8		6.3		0.3		−5.7		30
Norfolk, Va.[2] (10 m)	16.5	−1.2	17.5	+0.3	14.9	−0.3	12.0	−0.5	8.9	−0.7	5.9	−0.9	3.7	−0.4	−2.0	−0.7	−8.5	−1.2	22
Oklahoma City, Okla.[2] (391 m)	18.1		18.7		17.9		15.1		11.7		8.8		5.8		−0.6		−6.9		30
Omaha, Nebr.[2] (300 m)	16.3	+2.7	17.6	+3.1	16.3	+2.1	13.4	+1.4	10.8	+1.2	7.6	+0.9	4.2	+0.6	−2.6	+0.6	−9.4	+0.7	31
Pensacola, Fla.[3] (13 m)	20.3	−2.0	20.6	−0.2	17.8	−0.3	14.5	−1.2	11.7	−0.9	9.0	−1.0	6.6	−0.9	1.4	−0.5	−3.9	+0.2	30
San Diego, Calif.[3] (10 m)	16.5	−0.9	14.5	+0.4	15.3	+1.3	15.8	+2.7	14.1	+2.2	11.7	+2.3	8.8	+2.2	3.3	+2.7	−2.8	+3.0	30
Scott Field (Belleville), Ill.[1] (135 m)	13.7		18.5		16.7		13.2		10.4		7.9		4.9		−1.3		−7.5		30
Seattle, Wash.[3] (10 m)	12.9	−0.2	7.3	−2.7	4.2	−3.5	0.9	−4.1	−2.3	−4.5	−5.1	−4.6	−8.5	−5.4	−16.3	−7.1	−26.0	−10.4	6
Selfridge Field (Mount Clemens), Mich.[1] (177 m)	11.8		14.6		12.8		9.5		6.0		3.0		0.3		−5.1		−11.9		27
Spokane, Wash.[3] (596 m)	11.0				14.5		14.1		12.0		8.8		5.5		−1.5		−9.0		31
Washington, D. C.[3] (13 m)	14.4	−1.9	15.9	+0.9	13.9	+0.8	11.6	+1.0	9.0	+0.9	6.4	+0.9	3.8	+0.9	−2.0	+0.5	−7.6	+0.8	30
Wright Field (Dayton), Ohio[1] (244 m)	12.7		16.7		15.1		12.2		9.2		6.4		3.8		−2.0		−8.1		30

RELATIVE HUMIDITY (PERCENT)

Barksdale Field (Shreveport), La.	85		61		64		66		61		56		53		49		32		
Billings, Mont	54						44		44		45		48		53		48		
Boston, Mass	73	+6	61	+1	61	+3	63	+5	59	+2	56	+2	52	0	49	+2	47	+1	
Cheyenne, Wyo	70								63		53		50		53		56		
El Paso, Tex	45						47		47		47		47		51		57		
Fargo, N. Dak	77		63		57		53		52		52		53		54		49		
Kelly Field (San Antonio), Tex	93		87		84		77		71		67		60		53		47		
Lakehurst, N. J	80		65		61		61		57		56		48		46		38		
Maxwell Field (Montgomery), Ala	80		60		60		67		62		64		58		48		37		
Mitchel Field (Hempstead, L. I.), N. Y	85		77		73		72		76		65		63		58				
Murfreesboro, Tenn	79		62		60		63		65		56		50		40		35		
Norfolk, Va	77	+4	58	−4	62	+4	64	+7	63	+7	59	+4	50	−1	36	−4	33	−4	
Oklahoma City, Okla	83		75		60		59		59		57		51		45		38		
Oma, Nebr	78	0	66	−5	60	−3	60	0	56	−1	58	+3	55	+3	54	+5	53	+6	
Pensacola, Fla	89	+6	77	0	77	+6	80	+14	74	+14	68	+14	61	+12	53	+13	46	+11	
San Diego, Calif	79	+7	79	+1	57	−6	35	−15	28	−10	24	−9	22	−7	18	−8	16	−8	
Scott Field (Belleville), Ill	84		58		53		56		55		46		44		35		32		
Seattle, Wash	72	−1	73	−1	72	+1	72	+3	75	+7	68	+5	68	+10	65	+9	64	+11	
Selfridge Field (Mount Clemens), Mich	83		60		54		58		60		57		52		42		38		
Spokane, Wash	69				59		55		55		57		60		61		59		
Washington, D. C	79	+10	55	−5	52	−4	45	−10	47	−8	48	−6	47	−5	45	−3	36	−8	
Wright Field (Dayton), Ohio	86		63		58		60		61		57		53		49		46		

Observations taken about 4 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.
[1] Army.
[2] Weather Bureau.
[3] Navy.

NOTE.—The departures are based on "normals" covering the following total number of observations made during the same month in previous years, including the current month: Boston, 103; Norfolk, 151; Omaha, 155; Pensacola, 196; San Diego, 174; Seattle, 73; Washington, 223.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m. (E. S. T.) during May 1936*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfreesboro, Tenn. (180 m)	
	Direction	Velocity	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	47	1.6	13	0.5	275	2.6	266	2.4	284	2.7	179	1.3	58	0.4	254	1.7	172	1.1	85	2.0	90	2.7	287	0.1	10	0.4
500	-----	-----	119	1.6	-----	-----	283	8.0	-----	-----	223	5.7	197	1.7	271	4.5	215	4.3	134	6.3	99	5.0	290	0.4	159	2.5
1,000	-----	-----	129	2.8	-----	-----	284	7.3	-----	-----	249	5.4	262	3.7	278	6.1	257	4.7	134	5.4	107	5.0	284	1.1	196	3.7
1,500	-----	-----	119	1.8	231	4.2	282	8.9	-----	-----	269	5.9	273	5.6	281	6.7	270	4.4	137	3.2	97	3.3	140	0.7	217	3.3
2,000	175	1.2	147	1.5	244	4.5	279	9.4	273	3.7	279	6.6	270	6.9	284	7.8	291	4.9	149	1.9	87	2.2	149	1.6	241	3.1
2,500	225	2.6	136	2.6	260	4.6	285	10.9	270	4.4	293	6.7	270	7.2	297	8.1	307	4.0	142	0.8	108	1.3	195	2.7	266	2.5
3,000	249	3.5	177	2.2	267	4.8	283	10.8	264	3.0	297	6.7	286	8.4	298	10.0	255	6.2	147	0.8	65	0.4	204	2.5	257	1.5
4,000	266	4.2	200	2.6	275	5.0	285	10.1	272	3.4	307	14.6	302	11.6	286	12.1	315	5.3	40	1.0	253	2.4	227	3.5	206	2.8
5,000	255	3.7	187	2.0	277	5.3	295	11.1	304	5.5	301	13.2	-----	-----	284	11.8	-----	-----	16	1.9	-----	-----	260	5.4	302	1.4

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Territory of Hawaii [1] (68 m)		Pensacola, Fla.[1] (24 m)		St. Louis Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washington, D. C. (10 m)	
	Direction	Velocity	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	292	1.3	226	0.5	166	2.7	146	1.5	57	5.0	78	4.1	183	1.1	155	3.1	42	0.6	29	0.4	163	1.3	148	0.9	304	0.5
500	302	6.8	213	2.3	153	3.6	174	3.5	69	8.2	90	6.7	188	4.8	-----	-----	324	1.9	343	1.0	178	0.8	-----	-----	283	5.0
1,000	305	5.8	346	4.3	175	8.6	208	6.9	72	9.1	110	5.0	231	4.7	-----	-----	344	3.6	290	5.9	208	1.5	206	2.9	292	4.9
1,500	287	6.8	332	3.2	186	4.9	226	7.2	84	7.8	132	3.5	238	4.0	160	3.7	331	4.1	284	6.2	244	1.6	224	3.4	293	5.1
2,000	277	8.2	321	3.0	194	2.8	231	6.6	-----	-----	126	2.7	247	3.3	176	3.0	322	2.9	313	10.2	245	3.5	216	2.1	294	7.3
2,500	281	9.4	326	4.2	210	2.2	245	3.5	-----	-----	139	1.8	309	3.8	208	2.0	344	2.9	318	11.1	245	5.6	213	2.7	295	8.3
3,000	286	8.0	307	3.3	238	1.5	306	3.4	-----	-----	115	2.1	318	3.8	218	2.3	341	4.4	322	13.1	249	7.3	226	4.3	288	9.4
4,000	-----	-----	273	8.7	94	0.5	339	2.9	-----	-----	31	1.1	-----	-----	225	4.7	317	6.5	329	15.2	241	9.8	243	5.8	291	10.0
5,000	-----	-----	-----	-----	32	1.4	-----	-----	-----	-----	-----	-----	-----	-----	276	4.3	294	4.6	324	18.8	-----	-----	235	8.0	-----	-----

[1] Navy stations.

RIVERS AND FLOODS

[River and Flood Division, MONTROSE W. HAYES in charge]

By W. J. MOXOM

Floods did not occur during May in any of the major streams of the United States, although stages in the lower Mississippi River were fairly high during the first part of the month because of the discharge from the Ohio River flood of March and April. Light to moderate floods occurred in widely separated sections in several of the smaller streams. The most severe was in southeastern Colorado, where torrential rain on May 30 caused a rapid rise to above flood stage in the Arkansas River in the vicinity of Lamar and Holly, Colo., including the tributaries both north and south of the main stream. Newspaper and other accounts report the loss of six lives in southeastern Colorado and the adjacent area in western Kansas. Reported estimates of property losses in this vicinity total nearly $500,000. Estimated flood losses elsewhere during May amount to $34,300.

The following remarks are compiled from reports rendered by the various district centers:

Columbia, S. C.—The Santee River at Rimini and Ferguson, S. C., was slightly above flood stage during the first few days of the month; this was a continuation of the April flood. No flood losses occurred in May.

Meridian, Miss.—Moderately heavy to heavy rains occurred over the Meridian river district during the last 3 days of April, causing a rapid rise in the rivers. Prior to these rains the streams were all seasonably low, indicating a dry soil, with the swamps relatively dry. This condition accounts for the fact that only a light flood occurred in the central and lower Pearl watersheds, while flood stages were not reached in the Pascagoula watershed. Estimated flood losses in the Pearl River system from all sources were $10,250.

La Crosse, Wis.—For the third time this season the upper Mississippi was near flood stage. The crest passed La Crosse at 11 a. m. of the 13th, with a stage of 10.83. The only station at which flood stage was reached was Durand, Wis., on the Chippewa River, where a crest of 11.3 feet, 0.3 foot above flood level, occurred on the 9th. The high water during May was caused by frequent heavy rains in the headwaters during the first week of the month. After the 15th the rivers began to fall at a rapid rate. Flood losses during the month were very light.

Topeka, Kans.—The only overflow in the district during May was a slight one of the upper Solomon River, which reached a crest of 22.2 feet (4.2 above flood stage) at Beloit, Kans., on the 12th. The total estimated damage was $1,300, the greater part of which was to prospective crops.

Concordia, Kans.—Slight flooding occurred during the month in the lower Republican River. Estimated losses amounted to about $500 to growing crops, mostly in the vicinity of Junction City, Kans.

Indianapolis, Ind.—Flood stages were passed on the Wabash River at La Fayette, Covington, and Terre Haute, Ind. While there was a considerable rise in the river above La Fayette no flooding occurred in that reach. Below Terre Haute the flood flattened rapidly, owing to the light rainfall over the lower reach, and stages were considerably short of flood below Terre Haute. Losses were negligible.

Wichita, Kans.—There was flooding of lowlands between Syracuse and Dodge City, owing to heavy rains in eastern Colorado and western Kansas during the last few days of May. Damages were not reported.

Shreveport, La.—Moderate flooding occurred in the Sulphur River in northeast Texas, with the estimated damages amounting to about $12,000, the greater part to growing crops.

Dallas, Tex.—There was a light flood in the Trinity River in the vicinity of Dallas, Tex. Some growing crops were overflowed, but resulting losses were very light.