METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR JULY 1943

[Climate and Crop Weather Division, J. B. KINCER, in charge]

AEROLOGICAL OBSERVATIONS

NOTICE.—Effective with the December 1942 issue, the publication of table 1 (RAOB summaries) was discontinued indefinitely.—EDITOR.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during July 1943. Directions given in degrees from north (N=360°, E=90°, S=180°, W=270°). Velocities in meters per second*

Altitude (meters) m. s. l.	Abiline, Tex. (538 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (100 m.)			Charleston, S. C. (17 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)			El Paso, Tex. (1,196 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	149	2.5	31	234	2.2	28	277	1.5	31	237	1.1	31	243	1.0	31	318	4.8	31	141	7.3	31	227	2.9	30	264	0.8	29	200	1.8	31	(1)	0.0	31	29	1.6	31	154	2.5
500	---	---	---	---	---	---	28	264	2.1	---	---	---	---	---	---	---	---	---	31	151	8.1	31	250	3.2	30	247	2.0	29	201	4.1	31	226	1.2	---	---	---	---	---	---
1,000	31	150	2.9	---	---	---	27	275	2.5	---	---	---	31	254	1.6	31	319	4.7	29	160	6.7	30	257	3.6	30	253	3.3	27	234	2.8	31	262	1.9	---	---	---	---	---	---
1,500	31	148	2.7	---	---	---	27	290	2.8	31	249	1.2	31	260	2.9	31	315	2.8	28	157	3.8	30	270	4.0	29	266	5.1	24	274	2.4	31	276	3.2	---	---	---	31	157	2.1
2,000	30	135	2.4	31	223	2.4	25	304	3.8	31	280	1.5	28	248	4.6	31	302	2.0	24	145	2.3	27	275	4.4	25	274	6.4	23	298	2.1	29	289	4.5	31	38	1.7	31	141	2.2
2,500	27	143	2.6	31	205	1.4	22	315	4.6	31	271	3.4	26	270	6.0	31	274	2.6	22	133	2.0	19	276	4.4	22	280	7.2	21	296	3.1	23	292	4.5	31	57	2.0	31	94	1.8
3,000	26	154	2.2	30	197	0.9	21	321	4.9	31	266	5.8	24	276	7.6	30	256	4.0	21	131	2.3	12	292	4.5	17	290	6.8	18	284	3.0	22	302	5.8	31	65	1.5	31	86	2.2
4,000	25	174	0.9	29	121	0.5	14	326	5.5	29	265	11.2	22	282	12.0	30	244	7.0	19	146	1.2	---	---	---	---	---	---	14	298	4.6	19	291	6.4	31	281	2.1	28	107	2.2
5,000	23	(1)	0.0	27	170	0.6	12	334	6.9	26	263	13.5	20	285	13.4	28	240	10.2	16	69	0.7	---	---	---	---	---	---	10	298	4.8	12	289	9.4	25	263	5.5	26	128	1.6
6,000	18	317	1.4	26	253	1.2	12	327	6.2	23	261	14.8	17	286	15.3	25	240	10.8	13	141	3.0	---	---	---	---	---	---	---	---	---	---	---	---	21	270	8.7	24	157	2.0
8,000	12	315	0.1	21	219	3.8	---	---	---	19	269	18.7	14	287	18.5	20	238	13.2	10	94	3.6	---	---	---	---	---	---	---	---	---	---	---	---	15	261	11.2	14	174	2.6
10,000	---	---	---	18	236	4.4	---	---	---	10	261	23.6	12	285	21.8	11	233	14.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	11	254	12.6	10	157	4.0
12,000	---	---	---	15	228	6.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Altitude (meters) M. s. l.	Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Joliet, Ill. (178 m.)			Las Vegas, Nev. (573 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (15 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)			New York N. Y. (15 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	210	1.7	27	332	1.9	30	246	0.4	31	255	3.4	31	156	2.9	31	353	0.8	31	175	2.3	31	182	1.6	31	305	2.6	31	137	3.1	31	217	1.5	31	261	1.5	31	178	3.1
500	---	---	---	---	---	---	30	229	1.5	---	---	---	31	192	3.5	31	339	1.0	---	---	---	31	200	1.9	31	308	3.4	31	151	3.3	31	199	2.5	31	271	2.2	31	224	3.5
1,000	---	---	---	---	---	---	28	233	2.3	31	259	4.6	29	224	2.8	31	293	1.9	31	179	3.3	31	225	1.3	31	317	3.6	31	164	2.0	29	231	1.7	30	290	2.7	31	264	3.9
1,500	---	---	---	27	325	2.1	27	260	2.9	31	256	5.2	29	266	2.6	31	284	3.0	31	181	3.6	30	281	1.5	31	296	2.0	27	151	1.0	24	336	1.4	27	300	3.4	30	270	5.2
2,000	31	212	2.2	27	288	2.3	25	294	3.3	29	261	5.9	27	289	1.8	29	285	5.2	31	197	4.4	29	308	1.9	31	231	1.5	25	136	0.8	22	352	2.3	21	290	4.0	27	279	5.9
2,500	31	211	3.3	27	257	2.0	21	289	3.8	28	267	8.5	24	308	1.2	26	287	6.6	31	201	4.4	24	324	2.4	30	213	2.6	25	150	0.6	21	359	2.7	19	295	5.4	20	286	5.5
3,000	31	210	3.5	27	237	2.9	17	301	4.1	25	267	9.1	25	354	0.9	24	295	8.1	31	214	4.8	22	323	2.9	30	228	4.2	26	174	0.7	19	7	3.0	17	296	4.8	17	280	5.2
4,000	29	210	4.6	25	247	3.2	16	300	4.2	20	273	9.1	22	331	1.8	18	305	9.4	31	211	5.0	18	326	3.2	28	229	5.5	24	105	1.5	13	338	0.4	12	330	4.1	12	293	6.8
5,000	23	222	5.3	21	253	2.2	12	297	5.6	16	270	12.5	17	317	2.0	14	306	11.5	29	218	5.9	12	315	3.1	27	237	7.8	19	71	2.7	---	---	---	10	318	5.6	10	300	8.2
6,000	18	234	7.5	19	268	3.2	---	---	---	13	271	13.6	12	330	2.3	12	301	13.7	26	215	5.1	---	---	---	23	242	6.7	15	77	4.0	---	---	---	---	---	---	---	---	---
8,000	13	234	13.8	---	---	---	---	---	---	---	---	---	10	336	3.3	---	---	---	23	218	9.0	---	---	---	22	232	8.9	12	61	4.6	---	---	---	---	---	---	---	---	---
10,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	22	217	14.0	---	---	---	15	218	10.3	---	---	---	---	---	---	---	---	---	---	---	---
12,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	21	222	14.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	17	222	13.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12	202	8.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (388 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			St. Paul, Minn. (225 m.)			San Antonio, Tex. (240 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (230 m.)			Seattle, Wash. (12 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	275	6.0	31	158	5.0	31	161	1.4	31	274	1.6	31	112	1.1	30	278	0.8	31	214	2.1	30	151	2.9	31	278	3.9	30	287	2.9	30	259	2.4	31	225	2.7	31	196	0.7
500	31	279	3.6	31	155	5.3	31	168	1.4	31	276	2.4	---	---	---	30	282	1.3	31	216	2.6	30	135	3.8	31	296	2.7	30	284	3.2	30	246	1.8	---	---	---	31	209	2.2
1,000	29	280	2.1	31	164	4.8	31	193	2.7	31	264	2.1	31	117	1.0	30	279	1.8	31	238	3.6	30	136	4.1	31	264	1.4	30	285	4.4	24	252	1.3	31	220	3.7	28	223	2.5
1,500	29	246	1.1	31	174	4.9	31	231	3.5	31	253	3.3	31	108	0.8	30	281	2.7	30	258	3.6	29	145	2.8	30	260	2.1	29	285	4.7	21	223	1.2	31	229	3.7	25	266	3.0
2,000	29	205	1.5	31	181	4.4	31	249	4.5	31	243	3.1	31	204	0.2	30	286	3.9	27	281	5.0	28	96	1.1	30	222	3.1	28	304	4.9	19	219	1.9	30	228	4.3	21	279	4.4
2,500	28	181	2.8	31	200	2.9	29	268	5.4	31	246	2.3	31	243	2.5	26	295	5.5	24	293	6.7	27	129	1.8	30	212	3.6	27	299	6.0	19	234	3.7	27	232	6.1	17	291	6.0
3,000	28	190	3.5	30	219	2.5	28	276	5.4	31	214	2.3	31	254	5.0	24	293	6.8	23	291	8.7	24	111	2.1	30	206	4.5	25	299	6.9	17	234	5.6	25	244	7.5	15	300	7.1
4,000	28	202	5.1	25	244	2.0	25	295	5.8	31	166	2.5	27	270	9.0	23	292	8.3	21	298	11.2	20	93	3.6	27	204	4.3	23	299	7.6	16	236	7.9	22	234	11.6	14	289	9.5
5,000	27	208	6.0	19	294	1.6	18	301	7.9	30	172	3.3	22	275	12.2	20	301	8.0	15	299	12.3	15	32	2.5	25	195	3.9	18	309	9.6	16	237	10.3	15	243	14.8	10	287	9.0
6,000	27	208	7.7	17	313	3.2	17	299	9.1	27	156	3.7	17	272	13.5	18	294	8.9	12	302	13.0	12	87	2.4	23	191	4.3	16	317	11.8	13	240	10.0	13	242	16.3	---	---	---
8,000	23	225	9.0	12	260	3.4	13	290	14.0	25	182	5.5	13	267	14.8	15	307	9.8	---	---	---	13	112	3.9	11	224	3.5	---	---	---	---	---	---	11	243	19.8	---	---	---
10,000	18	222	11.2	10	237	6.7	10	292	17.2	24	196	8.5	10	269	22.8	11	305	9.4	---	---	---	11	109	5.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12,000	13	235	10.9	---	---	---	---	---	---	22	198	10.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14,000	---	---	---	---	---	---	---	---	---	19	208	7.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

[1] calm.

TABLE 3.—*Maximum free-air wind velocities (m. p. s.), for different sections of the United States, based on pilot-balloon observations during July 1943*

Section	Surface to 2,2500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m). m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	34.0	wnw.	2,460	17	Portland, Maine	33.7	wnw.	2,500	17	Portland, Maine	60.3	w.	13,850	18	Portland, Maine.
East-Central [2]	20.9	wsw.	1,500	29	Cincinnati, Ohio	26.5	w.	3,520	7	Nashville, Tenn	38.6	w.	11,470	26	Huntington, W. Va.
Southeast [3]	21.4	wnw.	810	7	Birmingham, Ala	18.3	nnw.	4,960	31	Charleston, S. C	28.0	nne.	12,780	14	Atlanta, Ga.
North-Central [4]	34.7	sw.	1,610	2	Duluth, Minn	35.2	w.	5,000	14	Alpena, Mich	66.0	wnw	10,640	29	Saint Paul, Minn.
Central [5]	28.7	sse.	2,150	29	Dodge City, Kans	29.2	sw.	3,820	23	North Platte, Nebr	44.0	wnw.	10,650	14	Des Moines, Iowa.
South-Central [6]	24.6	ssw.	2,270	28	Houston, Tex	24.5	nw.	4,520	7	Texarkana, Ark	44.0	sw.	13,200	16	Oklahoma City, Okla.
Northwest [7]	35.6	nw.	2,480	28	Havre, Mont	33.3	wsw.	4,510	11	Pocatello, Idaho	57.6	sw.	9,610	28	Spokane, Wash.
West-Central [8]	33.1	sw.	2,500	11	Ely, Nev	38.5	w.	3,330	18	Casper, Wyo	55.0	ssw.	10,500	1	Ely, Nev.
Southwest [9]	24.4	ese.	1,850	13	Albuquerque, N. Mex	29.6	sw.	5,000	1	Las Vegas, Nev	49.5	ssw.	9,860	1	Las Vegas, Nev.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, Southern Ohio, Kentucky, Eastern Tennessee and North Carolina.
[3] South Carolina, Georgia, Florida andAlabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

River stages during July were decidedly below normal in the central Gulf States and in the Southwest, and below normal in an area extending from Maryland northward across central and eastern Pennsylvania and eastern New York. Elsewhere, normal, or above-normal, stages prevailed. Floods occurred principally in the Carolinas, the upper Mississippi Basin, and in the Columbia River Basin, but were mostly of a minor to moderate nature.

Precipitation during the month was above normal principally in Minnesota, Iowa, Indiana, Ohio, West Virginia, the Carolinas, Florida, and coastal areas of the west Gulf States; elsewhere there were general deficiencies. The driest areas were the central and south-central Mississippi Valley, the interior of the west Gulf area, the southern Great Plains and in the lower Potomac Valley.

Hudson Bay Drainage.—Two minor floods, causing slight damage, occurred in the Red River of the North at Moorhead, Minn., both originating during June, the first with a crest of 19.2 feet on June 6, and the second with a crest of 20.4 feet on July 2. Flood stage at Moorhead is 17 feet. No flood stages were reached at Wahpeton or at Grand Forks, N. Dak., upstream and downstream stations, respectively.

The early June rise was caused by heavy rainfall in connection with a disturbance which moved from eastern Nebraska to southwestern Minnesota on June 2. The 6-hour precipitation at Fargo, N. Dak., at 7:30 p. m., June 2, was 1.53 inches, and amounts of 1 inch or more occurred over much of the upper basin. These rains followed a showery period on May 29–30.

The rise late in June resulted from similar conditions. Rains of 0.5 inch occurred at many points. These rains were also preceded by a rainy period. At Hankinson, N. Dak., 1.34 inches of rain fell in a 48-hour period and the total for 7 days ending June 28 was 4.37 inches.

Great Lakes Drainage.—Moderate floods occurred in the Grand River and Flint River Basins in Michigan during June. This is the first time in 38 years that flood stages have occurred in the Grand River in the month of June. River stages were considerably above normal at the close of May from abnormally heavy precipitation. Heavy rains continued the first 2 days of June. Lowlands north of Grand Rapids were flooded from June 3 to 8 and the flood plains of the Grand River in Ionia and Kent Counties were inundated for several days, causing a loss to prospective crops estimated at about $1,000,000 in Ionia County.

Heavy rains on July 6–7 and 16–17, over the headwaters of the Maumee River Basin resulted in some flooding of lowlands. Flood stages were exceeded in the St. Joseph River at Montpelier, Ohio, on July 9, and in the St. Marys River at Decatur, Ind., July 17–18.

Flooding occurred in the vicinity of Toledo, Ohio, on July 6, when easterly winds causing high waves and tides in Lake Erie served to form breaks in an earthen dike along the Lake.

Atlantic Slope Drainage.—Precipitation was heavy during the month in the Carolinas and light to moderate overflows occurred principally in portions of the Roanoke, Neuse, Cape Fear, Pee Dee, Santee, and Savannah River watersheds. There were several periods during the first half of July when rainfall was heavy, mostly in the form of showers.

Upper Mississippi Basin.—High water and considerable flooding in the upper Mississippi Basin in June continued into July with a number of additional rises occurring in July. Reports of the floods are submitted by the officials in charge of the river district offices as follows (a report by the Minneapolis office was published in the June issue of the REVIEW):

LA CROSSE, WIS.

Widespread rains of the frontal thunderstorm type were responsible for three distinct flood periods in June; the first period beginning with a moderate flood in the Chippewa River on June 1 and culminating with flood conditions in the main channel of the Mississippi on June 7; the second beginning with floods in the Chippewa and extreme upper reaches of the Mississippi on June16, producing floods in the main channel from Reads, Minn., to Genoa, Wis., by June 22; and the third a flood of severe proportions in the Chippewa and extreme upper Black Rivers, beginning on June 27, which produced a secondary rise in the section from Reads to Genoa by July 2. Each succeeding flood took place on a fairly well developed recession from the former one. The flood occurring on the Chippewa at the end of June was most severe, and due to the fact that it was not supported by full flood volume from above Lake Pepin, considerable was lost in storage in that lake by flowing northward. This resulted in the flood stages from Reads to La