POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
	h. m.		°	°	°				
Nov. 17	11 5	5645	−84.0	234.7	−18.5	291			U. S. Naval.
		5641	−57.5	261.2	+20.0	97			
		5644	−27.0	291.7	−18.5		48		
		5640	−22.0	296.7	−22.0		97		
		5637	+4.5	323.2	+9.5		73		
		5643	+31.0	349.7	−22.0		48		
		5632	+48.0	6.7	−15.5		388		
		5631	+51.0	9.7	+22.0	194			
		5633	+80.0	38.7	+11.0	97		1,333	
Nov. 18	11 26	5645	−69.0	236.4	−18.5	291			Do.
		5641	−45.0	260.4	+20.0	73			
		5644	−13.5	291.9	+18.5		145		
		5640	−9.0	296.4	−24.0		73		
		5637	+19.5	324.9	+10.5		73		
		5643	+44.0	349.4	−21.0		36		
		5632	+62.0	7.4	−17.0		291		
		5631	+63.0	8.4	+21.0	194		1,176	
Nov. 19	11 24	5645	−56.0	236.2	−18.0	388			Mt. Wilson.
		5641	−31.5	260.7	+21.0	61			
		5644	+1.0	293.2	−18.5		145		
		5640	+3.0	295.2	−22.0		36		
		5637	+33.0	325.2	+11.0		97		
		5643	+59.0	351.2	−21.0		36		
		5632	+77.0	9.2	−17.0	291			
		5631	+78.0	10.2	+22.0	170		1,224	
Nov. 20	11 18	5647	−76.0	203.1	+6.0	24			U. S. Naval.
		5645	−42.0	237.1	−19.0	242			
		5641	−18.5	260.6	+21.0	61			
		5644	+13.5	292.6	−17.5	73			
		5637	+44.0	323.1	+10.5		24		
		5646	+61.0	340.1	−20.0	6		430	
Nov. 21	11 47	5650	−71.0	194.6	−26.0	12			Mt. Wilson.
		5647	−63.0	202.6	+7.0	24			
		5649	−51.0	214.6	−8.0	12			
		5645	−29.5	236.1	−19.0	339			
		5641	−4.0	261.6	+22.0		97		
		5644	+31.0	296.6	−15.0	61		545	
Nov. 22	11 4	5654	−80.0	172.8	+10.0		12		U. S. Naval.
		5653	−63.0	189.8	+12.0		97		
		5647	−50.0	202.8	+6.0	36			
		5645	−16.0	236.8	−19.0	291			
		5641	+8.5	261.3	+19.5	48			
		5644	+42.0	294.8	−14.0	24		508	
Nov. 23	11 4	5654	−66.0	173.7	+9.0	12			Do.
		5653	−50.0	189.7	+13.0		24		
		5647	−36.0	203.7	+7.0	12			
		5655	−14.5	225.2	+18.0	12			
		5645	−3.5	236.2	−19.5	242			
		5641	+20.5	260.2	+20.0	48			
		5648	+29.0	268.7	+8.0	6		356	
Nov. 24	11 6	5653	−38.0	188.5	+13.0		73		Do.
		5647	−22.5	204.0	+7.0	12			
		5645	+10.0	236.5	−19.0	242			
		5641	+33.5	260.0	+20.0	48		375	
Nov. 25	10 58	5653	−27.0	186.3	+15.0	12			Mt. Wilson.
		5657	−15.0	198.3	−12.0	6			
		5647	−8.0	205.3	+7.5	12			
		5656	+11.0	224.3	+10.0	24			
		5645	+23.0	236.3	−18.0	218			
		5641	+48.0	261.3	+21.0	36		308	
Nov. 26	11 44	5654	−22.5	177.2	+10.5		36		Do.
		5660	−8.5	191.2	+7.0		61		
		5653	−6.0	193.7	+13.0		24		
		5659	+25.0	224.7	+18.5		36		
		5656	+25.5	225.2	+9.5		97		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
	h. m.		°	°	°				
Nov. 26	11 44	5645	+36.0	235.7	−18.0	218			Mt. Wilson.
		5658	+58.0	257.7	+30.0	24			
		5641	+60.0	259.7	+20.5	36		532	
Nov. 27	11 23	5661	−15.0	171.8	−17.0		36		Do.
		5660	+5.0	191.8	+7.0		48		
		5656	+37.5	224.3	+9.5		194		
		5659	+39.0	225.8	+19.0		145		
		5645	+49.5	236.3	−18.0	218		641	
Nov. 28	10 58	5664	−79.5	94.3	−9.0		24		Do.
		5663	−70.0	103.8	+12.0		12		
		5661	−2.5	171.3	−17.5		16		
		5660	+17.0	190.8	+7.0	16			
		5656	+51.0	224.8	+10.0		339		
		5659	+51.0	224.8	+19.0		145		
		5645	+62.0	235.8	−18.5	218			
		5662	+85.0	258.8	−24.5		97	867	
Nov. 29	11 30	5664	−65.0	95.3	−9.5	36			U. S. Naval.
		5666	−14.5	145.8	−10.0		48		
		5665	+4.0	164.3	−17.0		24		
		5656	+64.0	224.3	+9.5		194		
		5659	+67.0	227.3	+19.0		73		
		5645	+75.0	235.3	−18.0		218	593	
Nov. 30	11 4	5664	−50.0	97.4	−10.0	36			Do.
		5666	−2.5	144.9	−9.5	36			
		5656	+78.0	225.4	+9.0	97			
		5659	+79.0	226.4	+19.0		48	217	

Mean daily area for 30 days, =903.

PROVISIONAL SUNSPOT RELATIVE NUMBERS, NOVEMBER 1937

[Dependent alone on observations at Zurich and its station at Arosa]

[Furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

November 1937	Relative numbers	November 1937	Relative numbers	November 1937	Relative numbers
1	104	11	79	21	60
2		12	83	22	
3	*aa* 103	13	*ab* 100	23	*a* 58
4	67	14	106	24	
5	*Wc* 68	15	74	25	*Mc*
6	49	16	69	26	*Mc* 70
7	*d* 34	17	*Ec*	27	96
8	*d* 47	18	*d* 90	28	64
9	*Mc*	19		29	68
10	*Ec*	20	82	30	47

Mean, 22 days=73.5.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group or spot through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity; *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, in the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

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

By LOYD A. STEVENS

Mean free-air data, based on airplane weather observations during the month of November 1937, are given in tables 1 to 3. A description of the methods by which the various monthly means and normals therein are computed may be found in the aerological sections of the MONTHLY WEATHER REVIEW for January and March 1937.

It will be noted that many of the "normals" are based on only 3 years of observations. Conclusions based on departures from such short period "normals" must be used with caution.

The mean surface temperatures for November (see Chart I) were generally above normal over the western third of the country, also over New England and the east portion of the North Atlantic states, and below normal elsewhere. The greatest positive departures (+2° to 3° C.) occurred over the central Rocky Mountain region. The negative departures were, for the most part between −1° and −2° C.

With a few exceptions the mean free-air temperatures for the month up to 5 kilometers were below normal. The most significant positive departures occurred over

Boston, below 2 kilometers, over El Paso, below 2.5 kilometers, and over San Diego above 2 kilometers. The greatest positive departures (+1.5° C.) occurred over Boston at 0.5 kilometer and over El Paso at 1.5 kilometers. The greatest negative departures occurred in the higher levels over Spokane (−4.4° C. at 5 km) and over Lakehurst (−5.0° C. at 4 km). The highest mean temperatures at all levels occurred over San Diego. The lowest mean temperature occurred over Fargo at 0.5 kilometer and over Sault Ste. Marie at all other levels. Above 3 kilometers, however, the mean temperatures at Fargo and Spokane were nearly as low as at Sault Ste. Marie. In general the mean free-air temperatures for November were lower than for October at all levels by 4° to 6° C. The greatest decrease in the mean temperature occurred at Omaha at 0.5 kilometers, where the value for November (+0.9° C.) was 9.5° C. lower than that for October (+10.4° C.).

The mean free-air relative humidities, shown in table 2, were near normal in the lower levels except at Lakehurst, where a marked negative departure was recorded, and at San Diego, where there was a marked positive departure. Above 1.5 kilometers the departures were positive at most stations, although negative departures of between −4 percent and −8 percent were recorded at Pensacola. The greatest positive departure (+24 percent) occurred at San Diego at 0.5 kilometers and the greatest negative departure (−12 percent) occurred at Lakehurst at 1 kilometer.

The mean free-air barometric pressures are shown in table 3. In general there was a decrease in the average pressure for November as compared with that for October, except that in the lower levels, there were small increases of 1 to 3 millibars over the southeast portion of the country. The mean free-air isobaric charts as drawn from the values in table 3 were characterized by a well-defined statistical center of low pressure over the region of the Great Lakes, the lowest mean pressure for the entire country occurring at Sault Ste. Marie at all levels. The highest mean pressure occurred over the southeastern States in the lower levels and over the northern portion of the Gulf States and San Diego in the higher levels. There was, in general, a marked steepening of the south to north pressure gradient across the eastern part of the country in November as compared with October.

Free-air resultant winds, based on pilot-balloon observations made near 5 a. m. (75th meridian time), are shown in table 4. For the most part the resultant wind directions were remarkably close to the normal at nearly all stations and at all levels. The most outstanding exception occurred at Oakland, where the current directions at the different levels varied between 207° (SSW.) and 299° (WNW.) while the normal directions vary between 13° (NNE.) and 333° (NNW.). A similar variation occurred also at San Diego between 2 and 3 kilometers. Resultant velocities were in general, above normal over the northeastern part of the country in the lower levels and over that portion of the country west of a line drawn between Houston and Spokane at all levels. Elsewhere they were below normal. The greatest negative departure from the normal (−4.4 m. p. s.) occurred over Oklahoma City at 3 kilometers and the greatest positive departure (+5.7 m. p. s.) occurred over Albuquerque at 5 kilometers.

Table 5 shows the maximum free-air wind velocities and their directions for various sections of the United States during November, as determined by pilot balloon observations. The extreme maximum for the month was 56.4 meters per second from the WSW. at 6,510 meters above seal level over Knoxville, Tenn.

The mean monthly specific humidities and equivalent potential temperatures are shown in tables 2 and 3, respectively. There was a decrease in the average specific humidities of November as compared with those for October over all stations and at all levels; the greatest decrease (−3.4 grams) occurring over Kelly Field at 0.5 kilometers. The mean equivalent potential temperatures for November were lower than for October by amounts ranging between 8° A. and 17° A. at 0.5 kilometers and ranging between 3° A. and 9° A. at 5 kilometers. The lowest mean specific humidities and equivalent potential temperatures occurred over Fargo in the lower levels and over Sault Ste. Marie in the upper levels. The highest mean specific humidities occurred over San Diego up to 1.5 kilometers, over Kelly Field at 2 and 2.5 kilometers, over Oklahoma City at 3 and 4 kilometers, and over Barksdale Field at 5 kilometers. The highest mean equivalent potential temperatures occurred over San Diego up to 4 kilometers but with equal values over Kelly Field at 2.5 and 3 kilometers. The highest values at 5 kilometers occurred over Maxwell Field and Kelly Field.

The weather for the month was dominated largely by the anticyclonic Pp and Pc air masses which usually entered the country from western Canada. These air masses were unusually slow moving and generally followed a more southerly course than is normal for this month. The relatively slow eastward movement of these air masses retarded the movement of the moisture-laden cyclonic air masses from the Aleutian Island region, over the North Pacific Coast States, and was apparently responsible for the above normal precipitation which occurred over the latter region. The more southerly track followed by the cold anticyclonic air masses served also to deflect toward the east most of the warm Ta air masses which attempted to move northward from the Gulf of Mexico over the lower Mississippi Valley; resulting in excessive rainfall over the Gulf States and along the Atlantic coast. The deficiency of rainfall over the remainder of the country east of the Rocky Mountains was apparently due to the dominance of the relatively dry Pp and Pc air masses over these regions. The prevalence of the anticyclonic Pp and Pc air masses over most of the country during the greater portion of the month accounted also for the fact that the free-air temperatures were decidedly below normal at all levels up to 5 kilometers.

TABLE 1.—*Mean free-air temperatures (t), °C obtained by airplanes during November 1937. (Dep. represents departure from "normal" temperature)*

Stations	Number of obs.	Altitude (meters) m. s. l. Surface t	Surface Dep.	500 t	500 Dep.	1,000 t	1,000 Dep.	1,500 t	1,500 Dep.	2,000 t	2,000 Dep.	2,500 t	2,500 Dep.	3,000 t	3,000 Dep.	4,000 t	4,000 Dep.	5,000 t	5,000 Dep.
Barksdale Field [1] (Shreveport), La. (52 m)	26	7.4	−0.9	8.5	−2.0	7.1	−2.5	5.9	−2.4	4.7	−2.0	2.7	−2.0	0.3	−2.3	−5.3	−2.7	−9.7	−1.8
Billing, Mont.[3] (1,090 m)	29	0.1	−0.2					2.4	−1.3	−0.1	−2.0	−3.5	−2.4	−6.6	−2.4	−13.5	−3.2	−19.9	−3.1
Boston, Mass.[1] (5 m)	25	4.0	+0.7	3.7	+1.5	1.9	+1.4	−0.2	+0.6	−2.3	0.0	−4.3	−0.2	−6.2	0.0	−11.6	−0.4		
Cheyenne, Wyo.[2] (1,873 m)	30	−1.5	−0.1							0.4	−0.3	0.8	−0.5	−2.1	−0.6	−8.7	−0.9	−15.4	−1.0
Chicago, Ill.[3] (187 m)	30	0.3	−2.2	0.2	−2.3	−0.6	−2.5	−1.2	−2.0	−2.8	−2.4	−4.6	−2.3	−6.7	−2.1	−11.6	−2.0	−17.6	−2.4
Coco Solo, Canal Zone [3] (15 m)	19	24.4		23.2		20.6		18.1		15.6		13.1		10.3		4.5		−1.3	
El Paso, Tex.[2] (1,194 m)	30	7.8	+1.0					11.8	+1.5	9.7	+0.5	6.8	0.0	3.6	−0.6	−2.9	−1.3	−9.6	−1.5
Fargo, N. Dak.[2] (274 m)	30	−5.3	+0.1	−3.2	0.0	−3.1	−0.5	−3.0	−0.6	−3.9	−0.6	−5.5	−0.3	−7.8	−0.3	−13.8	−0.7	−20.3	−0.9
Kelly Field (San Antonio), Tex.[1] (206 m)	28	11.1	+0.2	12.3	−1.3	11.2	−1.7	10.5	−0.9	9.0	−0.7	7.0	−0.8	4.7	−0.8	−0.9	−0.4	−7.5	−0.1
Lakehurst, N. J.[3] (39 m)	24	1.9	−3.1	3.4	−2.1	1.6	−2.2	−0.1	−2.5	−2.4	−3.2	−5.1	−3.9	−7.8	−4.6	−13.5	−5.0		
Maxwell Field (Montgomery), Ala.[1] (52 m)	9	10.7		13.1		11.2		9.6		7.9		6.3		3.6		−2.5		−6.7	
Mitchel Field (Hempstead, Long Island), N. Y.[1] (29 m)	28	3.7	−1.5	3.8	−1.4	1.7	−1.6	0.1	−1.5	−1.9	−1.9	−4.0	−2.2	−6.5	−2.7	−10.8	−1.5		
Nashville, Tenn.[2] (180 m)	30	5.4	−0.7	6.6	−0.8	5.4	−1.1	4.1	−1.5	2.5	−1.7	0.2	−1.8	−2.0	−1.9	−7.3	−1.7	−12.8	−1.2
Norfolk, Va.[3] (10 m)	23	6.6	−2.1	7.5	−1.8	5.5	−1.6	4.3	−0.9	3.0	−0.3	1.1	−0.4	−1.0	−0.5	−6.5	−0.5	−11.7	+0.4
Oakland, Calif.[2] (2 m)	30	11.3		12.1		10.4		8.9		6.9		4.7		1.7		−4.6		−10.8	
Oklahoma City, Okla.[2] (391 m)	30	5.2	−1.0	7.3	−0.5	6.8	−1.8	5.8	−2.0	5.0	−1.1	2.8	−1.0	0.4	−1.0	−5.7	−1.4	−11.6	−1.0
Omaha, Nebr.[2] (300 m)	30	0.1	−1.0	0.9	−1.5	0.6	−2.7	0.2	−2.7	−0.9	−2.6	−2.9	−2.6	−4.8	−2.2	−10.7	−2.2	−17.3	−2.3
Pearl Harbor, T. H.[3] (6 m)	30	21.8	−1.0	21.4	+0.3	18.0	+0.6	15.6	+1.0	13.3	+0.6	11.5	+0.6	9.0	+0.5	4.0	+1.3	−2.2	+1.5
Pensacola, Fla.[3] (13 m)	22	9.2	−3.0	11.0	−2.4	10.1	−2.0	9.2	−1.3	7.5	−1.4	5.8	−1.0	3.5	−0.8	−1.8	−0.7	−7.5	−0.4
St. Thomas, Virgin Islands [3] (8 m)	30	28.0		23.9		20.7		18.0		15.3		12.8		10.3		4.9		−1.1	
Salt Lake City, Utah [2] (1,288 m)	30	3.7						6.5		4.3		1.0		−1.4		−7.7		−12.9	
San Diego, Calif.[3] (10 m)	28	11.9	−2.8	13.6	−2.4	14.2	−1.3	12.8	−0.5	11.0	+0.1	9.2	+0.8	6.3	+0.5	0.2	+0.8	−6.4	+1.1
Sault Ste. Marie, Mich.[2] (221 m)	28	−0.5		−1.5		−3.4		−4.9		−6.2		−8.1		−10.4		−15.8		−21.6	
Scott Field (Belleville), Ill.[1] (135 m)	21	0.8	−1.1	4.3	−0.2	3.5	−0.3	3.3	−0.3	1.6	−0.6	−1.1	−1.2	−3.8	−1.4	−9.0	−1.5	−17.2	−3.0
Seattle, Wash.[3] (10 m)	6	11.0		9.7		7.8		5.4		3.5		0.8		−2.2		−9.1			
Selfridge Field (Mount Clemens), Mich.[1] (177 m)	28	1.2	−1.5	1.3	−2.2	−0.7	−2.6	−2.3	−2.9	−4.0	−3.4	−5.6	−3.1	−8.2	−3.4	−13.5	−3.5	−20.0	−4.0
Spokane, Wash.[3] (597 m)	30	4.2	+2.4			3.1	+0.2	1.3	−1.1	−0.9	−1.9	−3.8	−2.5	−7.3	−3.1	−14.2	−4.3	−20.8	−4.4
Washington, D. C.[3] (13 m)	27	3.9	−1.0	4.9	−0.2	3.5	−0.2	2.3	+0.3	0.1	−0.4	−2.1	−0.9	−4.5	−1.5	−10.4	−2.4	−16.2	−2.3
Wright Field (Dayton), Ohio [1] (244 m)	22	1.2	−0.6	2.4	−0.7	2.3	−0.3	1.8	+0.3	0.2	0.0	−1.3	+0.1	−3.5	+0.3	−9.3	0.0	−15.3	−0.2

[1] Army. [2] Weather Bureau. [3] Navy.

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii, where they are taken at dawn.

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 (years of record are given in parentheses following the number of observations): Barksdale Field, 80 (3); Billings, 116 (4); Boston, 124 (5); Cheyenne, 119 (4); Chicago, 88 (3); El Paso, 90 (3); Fargo, 116 (4); Kelly Field, 104 (4); Lakehurst, 102 (4); Mitchel Field, 98 (4); Nashville, 117 (4); Norfolk, 125 (6); Oklahoma City, 116 (4); Omaha, 204 (7); Pearl Harbor, 139 (5); Pensacola, 159 (7); San Diego, 215 (9); Scott Field, 90 (4); Selfridge Field, 105 (4); Spokane, 115 (4); Washington, 155 (7); Wright Field, 90 (4).

TABLE 2.—*Mean free-air relative humidities (R. H.), in percent, and specific humidities (q), in grams/kilogram, obtained by airplanes during November 1937. (Dep. represents departure from "normal" relative humidity)*

Stations	Number of observations	Altitude (meters) m. s. l. Surface q	Surface R. H. Mean	Surface R. H. Dep.	500 q	500 R. H. Mean	500 R. H. Dep.	1,000 q	1,000 R. H. Mean	1,000 R. H. Dep.	1,500 q	1,500 R. H. Mean	1,500 R. H. Dep.	2,000 q	2,000 R. H. Mean	2,000 R. H. Dep.	2,500 q	2,500 R. H. Mean	2,500 R. H. Dep.	3,000 q	3,000 R. H. Mean	3,000 R. H. Dep.	4,000 q	4,000 R. H. Mean	4,000 R. H. Dep.	5,000 q	5,000 R. H. Mean	5,000 R. H. Dep.
Barksdale Field, La	26	5.1	80	−2	4.6	63	−2	4.1	59	+1	3.7	54	0	3.5	52	+1	3.0	49	0	2.6	47	+1	1.9	46	+3	1.5	43	+3
Billings, Mont	29	3.2	71	+4							3.2	58	+4	2.8	59	+6	2.5	64	+8	2.3	66	+8	1.6	68	+10	0.9	63	+7
Boston, Mass	25	3.8	76	+2	3.7	72	+2	3.4	69	0	3.1	68	+4	2.7	66	+6	2.1	57	+3	1.8	53	+1	1.2	47	−2			
Cheyenne, Wyo	30	3.0	69	+5										3.2	65	+5	3.2	57	+4	2.7	55	+3	1.7	52	+2	1.0	54	+4
Chicago, Ill	30	3.0	77	−3	3.0	74	−1	2.8	68	0	2.6	60	−1	2.2	57	+2	2.0	54	+4	1.9	56	+6	1.2	49	+5	0.8	48	+5
Coco Solo, Canal Zone	19	18.4	96		16.9	90		15.1	89		13.4	87		11.9	85		10.3	82		8.6	79		6.7	79		4.9	79	
El Paso, Tex	30	4.0	54	−3							4.1	40	−4	3.6	38	−3	3.0	36	−4	2.5	36	−2	1.5	32	−3	0.9	28	−3
Fargo, N. Dak	30	2.0	78	−4	2.4	77	−1	2.4	70	−1	2.3	64	+2	2.2	61	+5	2.0	58	+4	1.7	57	+4	1.2	56	+4	0.8	55	+3
Kelly Field, Tex	28	6.6	80	−4	6.1	66	−2	5.8	63	0	4.9	53	−4	4.3	48	−4	3.6	43	−5	2.8	37	−3	1.8	32	−4	1.3	35	+4
Lakehurst, N. J	24	3.6	82	−1	3.4	65	−9	2.9	60	−12	2.5	56	−11	2.2	54	−8	2.0	54	−3	1.7	53	+1	0.9	43	−3			
Maxwell Field, Ala	9	6.6	82		5.8	59		5.3	59		5.0	57		3.8	46		2.6	32		2.0	29		1.1	22		0.9	22	
Mitchel Field, N. Y	28	3.9	79	−4	3.6	70	−5	3.2	68	−4	2.9	63	−5	2.7	64	+1	2.5	65	+8	2.1	61	+10	1.2	46	+1			
Nashville, Tenn	29	4.5	79	−2	4.3	68	−3	4.2	68	0	3.5	58	0	3.2	55	+6	2.7	53	+7	2.2	47	+7	1.7	48	+9	1.0	41	+4
Norfolk, Va	23	4.7	78	+2	4.3	64	−1	3.9	62	+1	3.5	58	−1	3.2	53	−2	2.8	50	+2	2.3	47	+5	1.6	45	+5	1.2	44	+8
Oakland, Calif	30	7.2	87		6.9	74		5.9	66		4.9	58		3.8	50		3.0	43		2.4	41		1.7	41		1.0	40	
Oklahoma City, Okla	30	4.4	77	0	4.6	69	−1	4.5	66	+4	4.0	58	+2	3.7	53	+1	3.4	54	+4	3.1	56	+8	2.2	56	+12	1.4	49	+9
Omaha, Nebr	30	2.9	74	−5	3.0	71	−2	2.9	65	+1	2.7	58	+2	2.5	55	+4	2.3	55	+7	2.1	54	+7	1.5	50	+4	0.8	47	+3
Pearl Harbor, Territory of Hawaii	30	13.2	81	+2	12.3	74	−2	11.2	78	−1	8.6	66	−8	6.7	56	−8	4.9	44	−6	3.6	36	−5	2.1	26	−5	1.2	22	−3
Pensacola, Fla	22	6.5	91	+8	6.6	77	+5	5.7	66	+1	4.7	56	−3	3.7	46	−5	3.0	38	−8	2.4	35	−8	1.7	32	−5	1.0	30	−4
St. Thomas, Virgin Islands	30	18.4	78		17.8	91		14.7	86		12.2	80		9.7	72		7.8	63		6.4	58		4.4	52		3.0	47	
Salt Lake City, Utah	30	4.0	71								4.2	60		3.6	56		3.2	59		2.9	60		2.0	58		1.3	53	
San Diego, Calif	28	7.8	91	+18	8.4	82	+24	6.8	60	+16	5.0	47	+10	3.8	37	+5	2.9	30	+1	2.3	26	−1	1.5	23	−2	0.9	25	0
Sault Ste. Marie, Mich	28	3.1	83		2.9	83		2.7	79		2.5	78		2.1	71		1.9	65		1.5	60		1.1	63		0.7	59	
Scott Field, Ill	21	3.3	79	−2	3.0	57	−7	2.9	54	−6	2.6	46	−6	2.4	44	−4	2.0	43	−2	1.8	44	0	1.2	39	−4	0.8	41	−1
Seattle, Wash	6	6.7	83		5.8	75		5.0	68		4.2	64		3.8	61		3.2	58		2.6	55		1.5	50				
Selfridge Field, Mich	28	3.4	81	−1	3.3	76	+1	2.9	72	−1	2.6	67	−1	2.2	60	+2	1.9	56	+2	1.7	55	+3	1.1	51	+2	0.7	48	+3
Spokane, Wash	30	4.8	86	0				4.0	85	+7	3.9	79	+10	3.4	76	+10	2.9	75	+11	2.3	74	+11	1.4	69	+11	0.9	65	+9
Washington, D. C	27	3.8	76	+3	3.4	60	−3	2.9	54	−6	2.6	49	−8	2.1	45	−8	1.8	41	−8	1.5	39	−2	1.1	40	+1	0.8	40	+3
Wright Field, Ohio	22	3.3	76	−5	3.3	69	−4	3.0	61	−4	2.7	54	−4	2.5	51	+1	2.3	50	+2	2.0	48	+2	1.4	46	0	0.9	42	−2

TABLE 3.—*Mean free-air barometric pressures (P), in mb, and equivalent potential temperatures (Θε), in °A, obtained by airplanes during November 1937*

Station	Number of Observations	Surface P	Surface Θε	500 P	500 Θε	1,000 P	1,000 Θε	1,500 P	1,500 Θε	2,000 P	2,000 Θε	2,500 P	2,500 Θε	3,000 P	3,000 Θε	4,000 P	4,000 Θε	5,000 P	5,000 Θε
		Altitude (meters) m. s. l.																	
Barksdale Field, La	26	1,016	293	961	297	905	300	851	304	801	307	752	309	707	310	628	312	555	317
Billings, Mont	29	892	291	-----	-----	-----	-----	847	298	796	300	747	301	702	302	612	304	539	305
Boston, Mass	25	1,017	286	956	291	899	293	845	295	794	297	744	299	699	301	614	305	-----	-----
Cheyenne, Wyo	30	811	298	-----	-----	-----	-----	-----	-----	798	301	749	307	704	308	619	309	544	310
Chicago, Ill	30	996	282	958	285	900	289	845	293	794	295	745	299	699	301	613	305	538	308
Coco Solo, Canal Zone	19	1,008	348	954	349	901	346	850	344	802	343	756	341	712	339	630	339	558	337
El Paso, Tex	30	883	303	-----	-----	-----	-----	851	311	802	313	754	313	709	314	626	314	550	316
Fargo, N. Dak	30	983	274	956	280	897	285	842	290	790	294	742	298	696	300	610	303	534	306
Kelly Field, Tex	28	995	303	961	306	905	309	852	311	803	313	755	315	710	316	627	317	553	319
Lakehurst, N. J	24	1,015	284	958	290	900	291	846	293	795	296	746	297	699	300	614	302	-----	-----
Maxwell Field, Ala	9	1,016	300	964	306	908	308	855	310	805	310	757	311	712	311	628	313	554	319
Mitchel Field, N. Y	28	1,016	286	958	290	900	292	846	295	795	298	746	300	700	302	615	306	-----	-----
Nashville, Tenn	[1] 30	999	291	962	295	904	298	850	301	800	303	751	305	705	307	621	310	546	313
Norfolk, Va	23	1,021	291	962	296	906	298	851	301	800	304	747	307	707	308	622	311	548	315
Oakland, Calif	30	1,019	303	960	308	904	308	851	310	804	310	753	310	708	311	624	313	550	315
Oklahoma City, Okla	30	974	293	961	296	904	301	851	304	800	308	752	310	707	312	623	314	547	316
Omaha, Nebr	30	984	282	960	286	902	290	848	294	796	298	747	301	701	304	616	307	541	308
Pearl Harbor, Territory of Hawaii	30	1,016	330	960	333	905	332	853	328	805	325	757	323	714	322	632	323	558	324
Pensacola, Fla	22	1,022	298	964	306	907	308	854	309	804	310	756	312	710	313	627	316	553	318
St. Thomas, Virgin Islands	30	1,013	353	958	352	904	345	853	341	804	336	757	333	713	332	632	331	559	331
Salt Lake City, Utah	30	874	299	-----	-----	-----	-----	852	305	800	306	752	307	707	309	622	311	547	314
San Diego, Calif	28	1,017	304	959	313	904	315	851	314	802	315	755	315	710	316	628	318	554	318
Sault Ste. Marie, Mich	28	987	282	953	284	895	286	840	290	788	292	738	294	692	296	606	300	530	304
Scott Field, Ill	21	1,005	283	961	289	903	293	849	298	798	300	749	302	704	304	618	307	546	308
Seattle, Wash	6	1,019	301	960	302	904	304	849	304	798	306	749	307	704	308	619	308	-----	-----
Selfridge Field, Mich	28	996	284	957	287	899	289	844	292	792	294	743	297	697	299	611	302	536	305
Spokane, Wash	30	946	295	-----	-----	901	297	847	299	796	301	746	302	701	301	614	302	538	305
Washington, D. C	27	1,021	285	962	291	905	293	850	297	799	298	750	300	704	302	618	306	544	309
Wright Field, Ohio	22	993	284	962	288	904	292	850	296	798	299	749	302	704	305	619	307	544	310

[1] Θε 29 observations.

TABLE 4.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m. (E. S. T.) during November 1937*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m) Direction	Albuquerque Velocity	Atlanta, Ga. (309 m) Direction	Atlanta Velocity	Billings, Mont. (1,088 m) Direction	Billings Velocity	Boston, Mass. (15 m) Direction	Boston Velocity	Cheyenne, Wyo. (1,873 m) Direction	Cheyenne Velocity	Chicago, Ill. (192 m) Direction	Chicago Velocity	Cincinnati, Ohio (153 m) Direction	Cincinnati Velocity	Detroit, Mich. (204 m) Direction	Detroit Velocity	Fargo, N. Dak. (283 m) Direction	Fargo Velocity	Houston, Tex. (21 m) Direction	Houston Velocity	Key West, Fla. (11 m) Direction	Key West Velocity	Medford, Oreg. (410 m) Direction	Medford Velocity	Nashville, Tenn. (194 m) Direction	Nashville Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	357	1.9	338	2.0	256	3.3	268	2.5	270	3.8	253	2.9	249	1.0	250	3.8	289	1.5	35	1.9	32	3.1	105	0.2	275	0.7
500	-----	-----	357	2.2	-----	-----	288	8.2	-----	-----	261	7.1	248	4.1	262	7.6	295	3.1	121	2.0	56	6.4	153	0.8	212	1.0
1,000	-----	-----	318	2.4	-----	-----	291	7.7	-----	-----	269	9.5	255	8.1	267	9.1	285	6.0	212	1.8	76	4.6	163	2.6	259	3.9
1,500	-----	-----	284	3.7	260	6.6	292	9.7	-----	-----	266	9.7	263	8.8	274	8.4	285	6.7	290	3.8	80	3.2	208	4.7	266	5.2
2,000	300	2.9	283	4.7	282	7.0	272	12.1	269	5.5	281	9.1	277	9.0	273	9.3	282	10.2	289	4.6	37	1.4	233	6.2	277	5.4
2,500	296	4.3	278	5.9	283	7.4	269	14.0	281	10.4	284	9.3	279	8.9	308	7.7	288	13.3	294	6.9	18	1.6	252	7.0	299	7.1
3,000	292	7.0	264	6.3	279	8.8	-----	-----	287	10.1	281	5.9	-----	-----	303	7.1	292	13.7	290	8.4	256	3.2	267	4.2	309	5.0
4,000	292	10.1	267	6.6	287	9.2	-----	-----	296	10.1	-----	-----	-----	-----	-----	-----	-----	-----	289	9.1	-----	-----	-----	-----	-----	-----
5,000	294	13.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Altitude (m) m. s. l.	Newark, N. J. (14 m) Direction	Newark Velocity	Oakland, Calif. (8 m) Direction	Oakland Velocity	Oklahoma City Okla. (402 m) Direction	Oklahoma City Velocity	Omaha, Nebr. (306 m) Direction	Omaha Velocity	Pearl Harbor, Hawaii [1] (68 m) Direction	Pearl Harbor Velocity	Pensacola, Fla. [1] (24 m) Direction	Pensacola Velocity	St. Louis, Mo. (170 m) Direction	St. Louis Velocity	Salt Lake City, Utah (1,294 m) Direction	Salt Lake City Velocity	San Diego, Calif. (15 m) Direction	San Diego Velocity	Sault Ste. Marie, Mich. (198 m) Direction	Sault Ste. Marie Velocity	Seattle, Wash. (14 m) Direction	Seattle Velocity	Spokane, Wash. (603 m) Direction	Spokane Velocity	Washington, D. C. (10 m) Direction	Washington Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	263	2.3	145	1.5	88	1.2	308	1.2	43	3.5	13	3.3	272	1.4	145	2.9	35	0.8	270	1.2	141	1.3	183	1.7	312	1.4
500	289	7.9	207	0.9	149	1.9	268	3.4	71	5.8	81	4.9	267	4.3	-----	-----	337	1.9	275	2.9	184	5.1	-----	-----	290	6.8
1,000	290	9.0	280	1.8	222	3.8	271	8.4	75	6.0	104	2.0	278	7.1	-----	-----	334	1.9	271	3.9	194	6.1	204	2.8	285	7.8
1,500	283	9.4	263	2.2	268	4.3	275	9.1	87	5.2	83	0.4	271	6.4	163	4.4	316	1.2	272	4.8	204	7.5	214	2.6	276	8.3
2,000	289	11.8	270	3.3	275	4.3	275	9.7	82	4.2	356	2.7	261	6.4	196	4.5	294	2.8	278	6.5	195	4.1	228	6.2	271	8.3
2,500	292	2.2	282	4.4	292	7.1	288	10.4	90	2.0	326	0.9	273	6.3	243	4.1	293	4.6	308	5.1	200	4.7	227	7.5	271	9.1
3,000	-----	-----	289	5.9	281	3.6	289	9.4	45	1.8	295	3.6	268	7.3	267	7.1	279	7.1	-----	-----	175	4.4	275	3.5	277	12.1
4,000	-----	-----	299	6.2	-----	-----	286	13.7	306	1.8	-----	-----	317	6.0	251	9.1	281	6.5	-----	-----	-----	-----	-----	-----	-----	-----
5,000	-----	-----	-----	-----	-----	-----	-----	-----	315	2.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

[1] Navy stations.

TABLE 5.—*Maximum free-air wind velocities, meters per second, for different sections of the United States, based on pilot-balloon observations during November 1937*

Section	Surface to 2,500 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]	38.6	WSW	2,230	9	Kylertown	43.1	NW	4,990	6	Buffalo	44.4	NW	5,170	6	Buffalo.
East-Central [2]	38.0	WSW	720	14	Knoxville	41.2	SW	4,420	14	Washington	56.4	WSW	6,510	7	Knoxville.
Southeast [3]	30.2	W	2,200	14	Atlanta	40.0	W	4,420	20	Jacksonville	49.6	WSW	10,360	30	Jacksonville.
North-Central [4]	37.7	WNW	620	2	Detroit	33.2	WNW	3,430	5	Fargo	38.8	WSW	10,910	11	Detroit.
Central [5]	38.6	SW	2,260	25	Chicago	43.2	W	3,760	2	Indianapolis	48.8	WNW	8,510	3	Evansville.
South-Central [6]	30.6	NW	2,500	14	Memphis	38.0	NW	3,950	14	Memphis	42.5	W	11,250	5	Abilene.
Northwest [7]	36.8	SW	1,590	8	Spokane	45.0	NNW	4,900	26	Boise	39.0	NW	5,730	26	Spokane.
West-Central [8]	26.4	NW	2,040	28	Denver	50.2	SW	3,600	23	Reno	54.4	W	10,400	12	Modena.
Southwest [9]	34.1	WSW	1,380	8	Havre	40.8	WSW	4,080	11	Las Vegas	52.8	WNW	7,040	21	Albuquerque.

[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, and Alabama.
[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.

RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD in charge]

By BENNETT SWENSON

Precipitation was deficient over most of the country during November. However, widely scattered regions received amounts considerably above the normal for the month. Thus, in a narrow belt along the Atlantic coast, in northeastern Texas and adjacent areas, and in the North and Central Pacific States, heavy precipitation occurred, the amounts being exceedingly heavy in portions of Oregon and northern California.

The excess precipitation along the Atlantic coast and over the Texas region resulted in light floods over portions of these areas. The crests of these rises are shown in the table below. No damage of any consequence occurred.

A series of storms occurred from about the 5th to the 27th of November over the North Pacific States, resulting in exceedingly heavy precipitation over the northern portion of the Sacramento Basin in northern California and over the Willamette Basin in Oregon and in adjacent regions.

The heaviest rainfall reported in the Sacramento Basin was 29.08 inches between the 10th and 24th at Kennett, Calif., and the greatest 24-hour amount at that place was 5.64 inches on the 20th. The stages in the Sacramento River from Red Bluff, Calif., to the mouth of the Feather River were not only by far the highest of record for November but equaled the high stages that usually occur only in midwinter and early spring. However, flood stage was exceeded only at Red Bluff, Calif., where the highest stage of 24.4 feet occurred on the 20th. The total loss resulting from the flooding is estimated at $97,000.

In the Willamette River Basin the greatest amount of precipitation recorded during November was 19.63 near Corvallis, Oreg. At Valsetz, Oreg., located a short distance west of the Coast Range Divide, a monthly total of 33.03 inches was measured. Of this 6.00 inches occurred on the 8th, preceded by 1.56 inches on the 7th, and followed by 1.41 inches on the 9th. There were 12 days with 1.00 inch or more of precipitation at this station.

Notwithstanding the excessive precipitation over the Willamette Basin, only three stations reported gage readings above flood stage, namely, Leaburg, Oreg., on the McKenzie; Jefferson, Oreg., on the Santiam; and Monroe, Oreg., on the Long Tom River. No damage was reported.

Estimates of losses that occurred in the flood in the Monongahela and Ohio Rivers during October, received too late for inclusion in the October REVIEW, are as follows: Monongahela River, $90,500, and Ohio River at Pittsburgh, Pa., $10,000.

CORRECTION TO JUNE REPORT

Page 248, table and chart showing precipitation in Pecos River Basin from May 23 to June 6, 1937:

Precipitation recorded for "Alamogordo Dam" occurred at Alamogordo, in Otero County, in southern New Mexico. No data are available for Alamogordo Dam. Table and chart should be corrected accordingly.

Table of flood stages in November 1937

[All dates in November unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE	*Feet*			*Feet*	
Tioughnioga: Whitney Point, N. Y.	12	12	13	13.1	12
James: Columbia, Va.	10	(1)	1	(2)	(2)
Roanoke: Williamston	10	(1)	9	(2)	(2)
		18	20	10.1	19
Santee:					
Rimini, S. C.	12	(1)	7	13.3	4, 5
		10	15	13.4	14
		17	21	13.2	19, 20
Ferguson, S. C.	12	(1)	8	(2)	(2)
		11	22	12.7	14, 15, 20, 21
MISSISSIPPI SYSTEM					
Arkansas Basin					
Petit Jean: Danville, Ark.	20	11	14	23.0	12
Sulphur: *Red Basin*					
Ringo Crossing, Tex.	20	10	13	22.8	10
		16	17	21.8	16
Naples, Tex.	22	18	24	23.7	22
PACIFIC SLOPE DRAINAGE					
Sacramento Basin					
Sacramento: Red Bluff, Calif.	23	20	21	24.4	20
Columbia Basin					
McKenzie: Leaburg, Oreg.	12	19	20	12.2	19
Santiam: Jefferson, Oreg.	10	20	20	10.6	20
		26	26	10.6	26
Long Tom: Monroe, Oreg.	10	22	26	12.8	25

[1] Continued from previous month.
[2] Crest occurred in October.