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PRELIMINARY REPORTS ON TORNADES IN THE UNITED STATES DURING 1938

By J. P. KOHLER

[Weather Bureau, Washington, February 2, 1939]

The present study is based largely on the data contained in table 3, severe local storms, appearing in the several issues of the MONTHLY WEATHER REVIEW published during the year 1938. A final and more detailed study will be published in the *United States Meteorological Yearbook, 1938*. The figures given here are substantially correct; however, it must be remembered that all are subject to change after the final study mentioned above.

In contrast to the previous year, 1938 brought some highly destructive tornadoes; none of them, however, compared in violence or severity with the Georgia tornadoes of 1936, or the outstanding St. Louis storm of 1927 or the tri-State tornado of 1925. Table 1 shows that 189 tornadoes occurred in 25 States; during the preceding year the total number reported was 123, a difference of 66 storms. The number of deaths caused by tornadoes in 1938 was reported as 178; this is a considerable excess over the comparatively small figure of 29, which was the tornado death toll in 1937. Injuries suffered from tornadoes in 1938, based on all available reports, were in excess of 2,189; for the preceding year the list of injured was only 192. Total property damage resulting from the 1938 tornadoes is estimated at nearly \$8,000,000.

Table 1, herewith, enumerates tornado frequency, deaths, injuries, and damage figures, by States during the year. It will be seen that the greatest number of tornadoes occurred in March with a total of 60 storms which is 44 greater than the 22-year average (1916-37) for that month. May was second in tornado frequency with 42 storms, an excess of 11 above normal; in April there were 26 or 3 more than normal. Thirteen tornadoes occurred in July, 8 each in August, September, and November, 2 in February, and 1 in December. October was the only month in which no storm of even possible tornadic character was reported.

The greatest loss of life resulting from tornadoes during the year occurred in March when 74 deaths were reported. There were 32 deaths in September, 21 in February, 17 in April, 15 in May, 14 in June, 3 in July, and 2 in Novem-

ber. The tornadic activity of August and December caused no loss of life.

Practically all of the total property loss, approximately \$7,790,000, occurred during the months of March, June, and September. The greatest monthly loss was in September and was due primarily to the series of destructive tornadoes which occurred in Charleston, S. C., and vicinity on the 29th.

Some of the most outstanding tornadoes (from the point of view of loss of life and property damage) in the United States during the year are as follows: In Kansas on March 10 a single tornadic disturbance caused 10 deaths, 150 injuries, and damage of about \$575,000. In Arkansas in the same month 1 tornado on the first, 4 on the 28th and 9 on the 30th resulted in 18 deaths, 287 injuries and damage of \$366,000. In Missouri during March, 4 tornadoes on the 15th caused 11 deaths, 27 injuries and damage estimated at \$257,000; and near the close of the month, on the 29-30th, 8 tornadoes were responsible for 5 deaths, 56 injuries and property damage exceeding \$224,000. On March 15 a series of 3 destructive tornadoes in Illinois caused 10 deaths, 77 injuries, and property damage to the extent of \$215,000, and 3 storms on the 30th resulted in 13 deaths, 89 injuries, and damage of more than \$1,500,000. On the same date a series of 6 minor tornadoes caused 4 injuries, but no deaths, and property damage estimated at \$59,000.

The most outstanding instance of destructive tornadic action during the year occurred in Charleston, S. C., and vicinity on September 29 when a series of 5 tornadoes in Charleston County killed 32 persons, injured 150 or more, and damaged property to the estimated extent of \$2,000,000. In this connection it may be stated that this is the greatest loss of life and property caused by tornadoes within a restricted area in that State during the period for which records are available.

In the event that the possible tornadoes enumerated in Table 2 are later adjudged to be true tornadoes, the 1938 figures will be 200 tornadoes, 181 deaths, 1,321 injuries, and property losses exceeding \$8,045,000. (See tables 1 and 2 on pp. 413-414.)

TABLE 1.—Tornadoes and probable tornadoes

State	January	February	March	April	May	June	July	August	September	October	November	December	Year
ALABAMA:													
Number.....	0	0	9	2	0	0	0	0	0	0	0	0	11
Deaths.....			2	10									12
Injuries.....			55	75									130
D a m a g e (\$×1,000).....			50.0	100.0									150.0
ARKANSAS:													
Number.....	0	0	14	0	5	0	0	0	0	0	1	0	20
Deaths.....			18		2						0		20
Injuries.....			287		20						0		307
D a m a g e (\$×1,000).....			366.0		46.6						0.5		413.1
COLORADO:													
Number.....	0	0	0	1	1	0	0	0	0	0	0	0	2
Deaths.....				0	0								0
Injuries.....				0	0								0
D a m a g e (\$×1,000).....				(¹)	25.0								* 25.0
FLORIDA:													
Number.....	0	0	0	1	1	0	2	0	0	0	0	0	4
Deaths.....				0	0		0						0
Injuries.....				0	0		0						0
D a m a g e (\$×1,000).....				0.3	0.2		(⁴)						* 0.5
GEORGIA:													
Number.....	0	0	0	3	0	0	0	0	0	0	0	0	3
Deaths.....				1									1
Injuries.....				2									2
D a m a g e (\$×1,000).....				30.0									30.0
IDAHO:													
Number.....	0	0	0	0	0	0	1	0	0	0	0	0	1
Deaths.....							0						0
Injuries.....							0						0
D a m a g e (\$×1,000).....							0.5						0.5
ILLINOIS:													
Number.....	0	0	12	0	0	2	2	0	0	0	0	0	16
Deaths.....			23			0	0						23
Injuries.....			170			0	0						170
D a m a g e (\$×1,000).....			2,064.0			1.0	43.7						2,108.7
INDIANA:													
Number.....	0	0	0	0	3	0	1	2	0	0	0	0	6
Deaths.....					0		0	0					0
Injuries.....					0		0	0					0
D a m a g e (\$×1,000).....					312.0		2.0	(¹)					* 314.0
IOWA:													
Number.....	0	0	1	0	1	0	2	0	0	0	0	0	4
Deaths.....			0		0		0						0
Injuries.....			14		0		0						14
D a m a g e (\$×1,000).....			8.0		7.0		* 0.4						* 15.4
KANSAS:													
Number.....	0	0	3	7	9	9	0	0	1	0	0	0	29
Deaths.....			11	0	6	0			0				17
Injuries.....			167	1	23	5			0				196
D a m a g e (\$×1,000).....			577.5	51.9	125.8	87.8		(¹)					* 843.0
KENTUCKY:													
Number.....	0	0	1	0	0	0	0	0	0	0	0	0	1
Deaths.....			0										0
Injuries.....			2										2
D a m a g e (\$×1,000).....			2.1										2.1
LOUISIANA:													
Number.....	0	1	1	1	0	0	0	1	0	0	3	0	7
Deaths.....		21	4	0				0			1		26
Injuries.....		40	9	8				0			10		67
D a m a g e (\$×1,000).....		250.0	5.0	12.5				0.7			8.5		276.7
MINNESOTA:													
Number.....	0	0	0	0	0	0	2	1	0	0	1	0	4
Deaths.....							0	0			0		0
Injuries.....							2	15			1		18
D a m a g e (\$×1,000).....							240.5	10.0			20.0		270.5
MISSISSIPPI:													
Number.....	0	0	1	4	0	0	0	0	0	0	1	0	6
Deaths.....			0	0							1		1
Injuries.....			0	16							0		16
D a m a g e (\$×1,000).....			3.5	31.0							4.5		39.0

TABLE 1.—Tornadoes and probable tornadoes—Continued

State	January	February	March	April	May	June	July	August	September	October	November	December	Year
MISSOURI:													
Number.....	0	0	13	0	3	0	0	0	1	0	0	0	17
Deaths.....			18		0				0				18
Injuries.....			83		0				1				84
D a m a g e (\$×1,000).....			* 491.7		13.5				(²)				* 505.2
NEBRASKA:													
Number.....	0	0	0	5	2	0	0	0	0	0	0	0	7
Deaths.....				5	0								5
Injuries.....				6	0								6
D a m a g e (\$×1,000).....				40.0	50.0								90.0
OHIO:													
Number.....	0	0	0	0	0	1	0	0	0	0	0	0	1
Deaths.....						0							0
Injuries.....						0							0
D a m a g e (\$×1,000).....						(¹)							(¹)
OKLAHOMA:													
Number.....	0	0	0	1	4	2	0	0	0	0	0	0	7
Deaths.....				0	0	0							0
Injuries.....				0	2	(¹)							2
D a m a g e (\$×1,000).....				10.0	61.85.0								101.1
PENNSYLVANIA:													
Number.....	0	0	0	0	1	1	0	0	0	0	0	0	2
Deaths.....					0	0							0
Injuries.....					0	0							0
D a m a g e (\$×1,000).....					8.0	40.0							48.0
SOUTH CAROLINA:													
Number.....	0	0	0	0	4	0	0	0	5	0	0	0	9
Deaths.....					0				32				32
Injuries.....					0				150				150
D a m a g e (\$×1,000).....													
SOUTH DAKOTA:													
Number.....	0	0	0	0	0	2	2	2	1	0	1	0	8
Deaths.....						0	3	0	0	0	0		3
Injuries.....						1	16	0	0	0	0		17
D a m a g e (\$×1,000).....						* 33.6	71.0	* 6.0	30.0		5.0		* 145.6
TEXAS:													
Number.....	0	1	5	1	5	2	0	1	0	0	1	0	16
Deaths.....			0	3	4	14							21
Injuries.....		24	0	50	10	10					2		96
D a m a g e (\$×1,000).....		50.0	60.0	30.0	33.3	200.0		(²)			1.0		* 379.3
VIRGINIA:													
Number.....	0	0	0	0	2	1	0	0	0	0	0	1	4
Deaths.....					3	0							3
Injuries.....					2	0							2
D a m a g e (\$×1,000).....					7.0	0.5						0.5	8.0
WISCONSIN:													
Number.....	0	0	0	0	1	0	1	1	0	0	0	0	3
Deaths.....					0		0	0					0
Injuries.....					2		0	0					2
D a m a g e (\$×1,000).....							10.0	(¹)	5.0				* 15.0
WYOMING:													
Number.....	0	0	0	0	0	1	0	0	0	0	0	0	1
Deaths.....						0							0
Injuries.....													

TABLE 2.—Tornadic winds and possible tornadoes ¹

State	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
ALABAMA:													
Number.....	1	0	0	0	0	0	0	0	0	0	0	0	1
Deaths.....	0												0
Injuries.....	0												0
Damage (\$×1,000).....	(²)												(²)
COLORADO:													
Number.....	0	0	0	0	0	0	0	1	0	0	0	0	1
Deaths.....								0					0
Injuries.....								0					0
Damage (\$×1,000).....								(²)					(²)
GEORGIA:													
Number.....	0	0	0	1	0	0	0	0	0	0	0	0	1
Deaths.....				0									0
Injuries.....				6									6
Damage (\$×1,000).....				(²)									(²)
INDIANA:													
Number.....	0	0	0	0	0	0	1	0	0	0	0	0	1
Deaths.....							3						3
Injuries.....							0						0
Damage (\$×1,000).....							50.0						50.0
IOWA:													
Number.....	0	0	1	0	0	0	0	0	0	0	0	0	1
Deaths.....			0										0
Injuries.....			0										0
Damage (\$×1,000).....			5.0										5.0
MICHIGAN:													
Number.....	0	0	0	0	0	0	0	2	0	0	0	0	2
Deaths.....								0					0
Injuries.....								7					7
Damage (\$×1,000).....								50.0					50.0

TABLE 2.—Tornadic winds and possible tornadoes—Continued

State	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
MINNESOTA:													
Number.....	0	0	0	0	0	0	0	1	0	0	0	0	1
Deaths.....								2					2
Injuries.....								0					0
Damage (\$×1,000).....								(²)					(²)
MISSISSIPPI:													
Number.....	0	0	0	0	1	0	0	0	0	0	0	0	1
Deaths.....					25								25
Injuries.....					25								25
Damage (\$×1,000).....					25.0								25.0
NEW JERSEY:													
Number.....	0	0	0	0	0	0	1	0	0	0	0	0	1
Deaths.....							0						0
Injuries.....							0						0
Damage (\$×1,000).....							25.0						25.0
PENNSYLVANIA:													
Number.....	0	0	0	0	0	0	1	0	0	0	0	0	1
Deaths.....							0						0
Injuries.....							0						0
Damage (\$×1,000).....							100.0						100.0
UNITED STATES:													
Number.....	1	0	1	1	1	0	3	4	0	0	0	0	11
Deaths.....	0		0	0	0		3	0					3
Injuries.....	0		0	6	25		0	9					40
Damage (\$×1,000).....	(²)		5.0	(²)	25.0		175.0	50.0					255.0

¹ These storms may or may not be classified as tornadoes when final study is made.
² Several hundred dollars.
³ Several thousand dollars.

NORTH ATLANTIC TROPICAL DISTURBANCES OF 1938

By WILLIS E. HURD

[Weather Bureau, Washington, January 1939]

The hurricane season of 1938 in North Atlantic tropical waters lasted for 3 months, or from about the 10th of August until the 10th of November. Of the eight disturbances charted, one was of such slight intensity that it did not cause winds of gale force; two caused gales not exceeding 8 or 9 in force; one attained local force of 11 on 1 day; one attained hurricane force in local squalls on 1 day; and three may be classed as true hurricanes, among them one being of long sustained, terrific energy which resulted in a major disaster on September 21 to Long Island and a considerable part of New England, where in the neighborhood of 600 lives were lost and property to the value of at least a quarter billion dollars was destroyed. This was one of the few hurricanes of record to carry heavy destruction into the New England states.

Five of the disturbances were shallow, in that their lowest reported central barometer readings did not fall to 29.50 inches; in two of the hurricanes the barometer fell below 29 inches, but in that of September central pressures were near or below 28 inches during most of its charted course.

Economically, exclusive of the New England hurricane, damage resulting from the 1938 disturbances was comparatively small, amounting perhaps to slightly more than a quarter million (estimated) dollars, of which the greatest part was done in southern Louisiana by the hurricane of August 9-14.

A synopsis of some of the more important features of the eight disturbances of 1938 is given in the table herewith. Their tracks, numbered I to VIII chronologically, are shown in the accompanying chart.

Four of the disturbances of the year crossed the Gulf of Mexico, and the entire eight were associated in all or some portions of their paths with the general West Indian region. Three were unusual in path. The track of the disturbance of October 10-17 (V) was very erratic in the Gulf of Mexico; that of October 17-21 (VI) originated in the extratropics near Bermuda and took a southwesterly course toward Florida; that of November 6-10 (VIII) took first a northwesterly then a southwesterly course into the Caribbean Sea.