

THUNDERSTORM-BREEDING SPOTS.

551.515

By ROBERT E. HORTON.

[Voorheesville, N. Y., October, 1920.]

It appears probable that under even favorable conditions as regards the cyclonic circulation, thunderstorms only develop from convective puffs of ascending air, when the violence of the ascending current exceeds some minimum limit corresponding to the weather conditions overhead for the day. It may happen that local conditions in a certain place will induce convective activity of sufficient strength to produce thunderstorms day after day, whereas at a near-by locality only a few miles distant only cumulus clouds will develop. An appropriate name for these spots where thunderstorms may be bred in large numbers is wanting, and so they may merely be called "thunderstorm-breeding spots." Very likely such spots are numerous, and could be quite accurately and permanently mapped with sufficient data. General observation indicates some locations where they may occur. For example, some cities, if not indeed most inland cities of say 100,000 population or more, appear to be thunderstorm spots.

The writer has observed some thunderstorms over some cities, for example, Albany, N. Y., and Providence, R. I., which originated immediately over the city and did not travel far outside their limits on days when there were no other adjacent thunderstorms. Again a shallow lake with sandy margins located in a forest may serve as a thunderstorm breeder. The writer has observed thunderstorms originating near the westerly end of Oneida Lake, traveling eastward about 18 miles, the length of the lake, and then dying out soon after reaching the easterly shore, on days when there were no thunderstorms in the surrounding country. Oneida Lake is about 5 miles wide and 18 miles long, located in a flat and generally wooded region and has warm, shallow waters and sandy shores. The water and sand of the lake become much warmer than the surrounding air, especially warmer than that in the woods on summer afternoons.

Capt. Harry Barker describes a number of occurrences of thunderstorms in the Grand Canyon of the Colorado. The air in the bottom of the Canyon became intensely overheated, and apparently rose to condensation level, which was below the rim, so that the thunderstorm with vivid playing of the lighting could be observed from the top of the Canyon rim, looking over the clouds to the opposite margin of the Canyon, which was clear.

Some western arroyos are notable for the frequency of occurrence of so-called cloudburst thunderstorms. Statistics are not available, but general reports seem to indicate that such storms occur more often on some arroyos than on others adjacent to them. The conditions of occurrence of thunderstorms in the Grand Canyon, and the conditions favoring thunderstorm-breeding spots, suggest that possibly some arroyos, or their drainage areas may be so situated as to form very favorable breeding spots for thunderstorms.

The facility of this operation may be affected by orientation and isolation, so that one arroyo basin might be a frequent starting point for thunderstorms, whereas another adjacent to it might rarely produce them. While this point is as yet purely hypothetical, it is worthy of further study, since a tendency to the frequent occurrence of thunderstorms in certain arroyo basins or on their headwater plateaus more often than on those adjacent, might be a very important factor affecting the

design of dams such as are commonly located in these canyons for irrigation and other purposes.

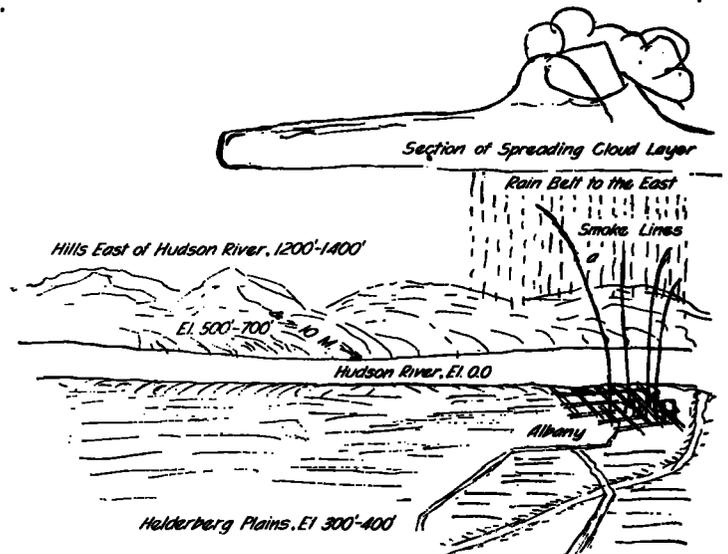
If it is true, as the writer believes, that certain places are exceedingly favorable to the generation of thunderstorms, then it appears to be a matter worthy of careful study. An indication of the truth of the supposition that cities breed thunderstorms might be obtained by comparison of rain gages in the surrounding country with records taken in the city during the thunderstorm months. Records of the number of thunderstorms taken in large cities are probably not sufficiently accurate to afford a reliable basis of comparison with thunderstorm frequency in the immediate surrounding country. Should it prove true that cities are in some instances thunderstorm breeders, whereas other near-by cities may not possess this characteristic, then such facts might have a very important bearing on various engineering problems, notably storm-sewer design, and might vitiate the utility of application of records of thunderstorm rain intensities in one city to another near-by city, even though the climate of the two places and the total rainfall per annum might be very nearly the same.

THE BEGINNING OF A THUNDERSTORM.

By ROBERT E. HORTON.

[Voorheesville, N. Y., August, 1920.]

It is not often that one can watch the inception of a local thunderstorm. Such an opportunity occurred to the writer on the afternoon of July 26, 1920. The



morning weather map showed an enormous high, prevailing generally over central New York, with isobar 30.1 at Albany. The writer was in the city of Albany during the afternoon. The sky was generally clear between 2 and 5 p. m., with occasional flat-bottom fair-weather clouds. Coming out of a building at 5 p. m., and starting westward by automobile, I noticed a layer of dark clouds directly overhead and heard thunder nearby to the east.

Within a few minutes, and at a time when I was about 1 mile west of the city, thunder became more violent. I noticed the cloud layer spreading rapidly in all directions, and there was a violent rush of cold wind from the west, followed within a few moments by a sprinkle of large raindrops. In the lower part of the city smoke was issuing freely from several power-plant and factory chimneys, and the course of the smoke leaving these chimneys in relation to the overlying cloud layer was something, as shown by the accompanying sketch. One smoke column, marked "A" in the sketch, in particular rose in a graceful parabolic line to a height apparently of 1,500 to 2,500 feet.

One can imagine the air near the surface becoming overheated during the afternoon, rushing upward, and spreading out at the cloud level, the upward course being marked roughly by the lines of smoke and the whole mass of air forming a solid shape very much like a flat-

topped mushroom. The sky was generally clear, and I encountered no rain in traveling 10 miles west of Albany.

During this trip I could look back eastward across the Hudson Valley and could see the back of a thunderstorm traveling eastward. The width of the rain belt was apparently not over 2 or 3 miles, judged from the known locations of adjacent hills.

After arriving at my home, and at least one hour after the storm started, at a time when the sky overhead was bright and clear, a sprinkle of large raindrops fell. The sky was clear from clouds everywhere, except far to the east, and it would appear that these raindrops may have been formed with the first uprush of air at Albany and had been slowly drifting westward with an upper air current, or with the spreading out of the mushroom top of the convective air column, finally being precipitated at least 9 miles from their place of origin.

#### TORNADOES OF APRIL 15, 1921, IN ARKANSAS AND TEXAS.

By W. C. HICKMON, Observer..

[Weather Bureau, Little Rock, Ark., Apr. 28, 1921.]

551.515(764)(767)

#### SYNOPSIS.

During the afternoon and evening of April 15, 1921, four tornadoes occurred in Arkansas and Texas. The most destructive of these started in Texas, but most of the damage done by it was in Arkansas, so the Texas end of the path is discussed briefly in connection with the Arkansas storms. Fifty-six people were killed in these four tornadoes, and the property loss is estimated at about \$1,300,000.

#### PRECEDING AND ATTENDING WEATHER.

The morning weather map of April 15 showed high pressure over the central Canadian Provinces, a storm of marked intensity centered over southeastern Colorado, and moderate disturbances over the lower lakes and extreme southern Texas. Temperatures had risen during the preceding 24 hours throughout the South but from the upper lakes westward cooler weather prevailed. The 15th was a sultry day in Arkansas, the sky overcast most of the time, the humidity high, the maximum temperatures at stations in the southern half of the State ranging from 70° to 80° F. with thunderstorms general. The evening map (fig. 1, p. 255), showed that the Colorado storm had moved slightly southeastward to the Texas Panhandle, the southern Texas storm northeastward, the two joining in a lopsided low pressure area with two centers, the one with the longer axis centering over northeast Texas and southwest Arkansas, and along this northeast-southwest axis where cold northerly winds and warm southerly ones were meeting there occurred between 12:45 p. m and 8:45 p. m. at least four tornadoes.

#### IN TEXAS.

Starting at Mineola, Wood County, Tex. (see fig. 1), at 12:45 p. m. with a funnel-shaped cloud, rotary winds, and a destructive path about 100 feet in width, the storm moved northeastward increasing in intensity and size, its path at Avinger, Cass County, at 2:30 p. m. varying from 400 to 600 yards in width. Here 8 people were killed, 14 seriously injured, and 30 slightly hurt. Continuing northeastward across the southeast corner of Bowie County, where two people were killed, the tornado crossed the Arkansas-Texas line at a point 8 miles south of Texarkana about 4 p. m.

#### IN ARKANSAS.

*Miller County.*—Continuing its northeastward movement the storm struck the Trigena community where

four people were killed. At Shiloh, 7 miles east of Texarkana, two lives were lost and the schoolhouse in which Miss Lena Owens, home demonstration agent, was conducting a club meeting, collapsed on the 15 members, all escaping serious injury.

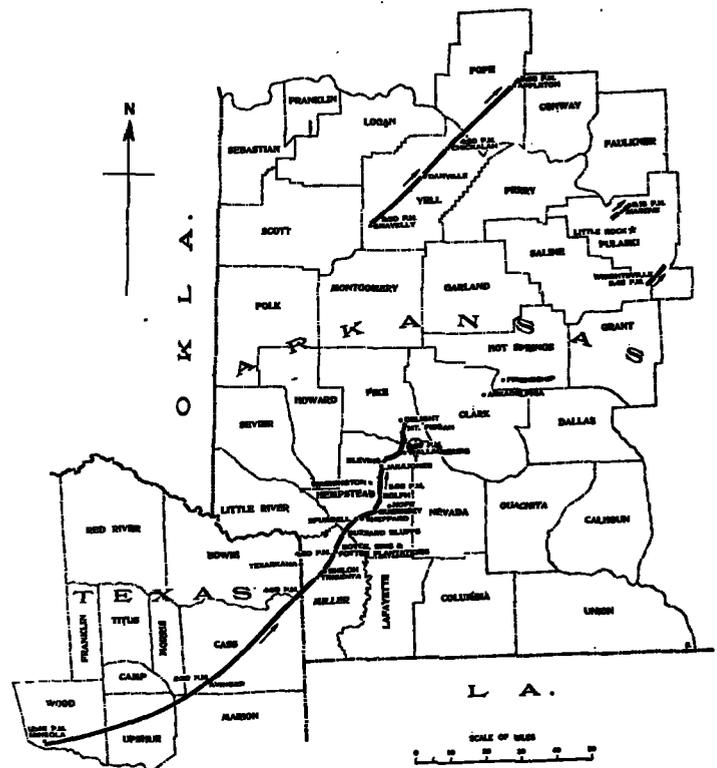


FIG. 1.—Map of northeast Texas and southwest Arkansas showing tracks of tornadoes, Apr. 15, 1921.

On the Boyce, Sims, and Potter plantations, about 3 miles further northeastward, farm buildings and Negro tenant houses were sucked from their moorings and deposited over the countryside, 10 people being killed. Moving on from these plantations the tornado crossed Red River into Hempstead County at Buzzards Bluff.