CLOUDS IN EAST TEXAS, JUNE 8, 1918.

(Explanatory description of non-instrumental observations made at College Station.)

By CHARLES F. BROOKS.

[Dated: College Station, Tex., Oct. 19, 1918.]

June 8 dawned with all factors favoring the occurrence of local showers. The wind was light, and some of the time from the east. High, cirrus clouds from the west-northwest, and cirro-cumulus clouds from the west-southwest, covered almost half the sky; and here and there were some rafts of alto-cumulus and strato-cumulus together, moving from the south-southwest.[1] These clouds at three levels were apparently the remnants of cumulo-nimbus clouds which had formed the day before (see figure). All seemed to have evaporated by 9 or 10 a. m. (90th meridian time).

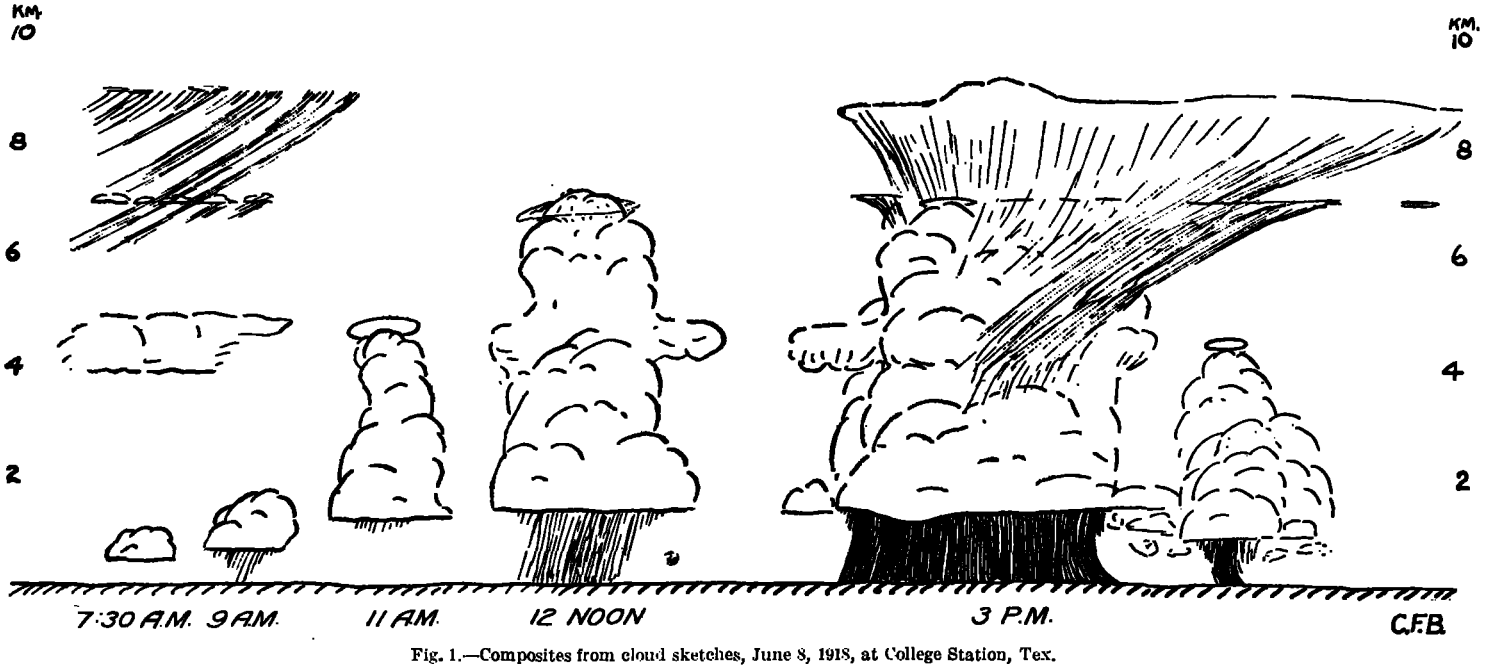

Fig. 1.—Composites from cloud sketches, June 8, 1918, at College Station, Tex.

Two hours of only partially interrupted sunshine started the usual convectional currents. On account of the dampness of the air, the dew-point in the rising columns was soon reached. So cumuli began to form at 7:25 a. m. (see figure) and grew with extraordinary rapidity, covering almost two-thirds of the sky by 8 a. m. While the cloud bases were still low some of the clouds grew so thick that shortly after 9 a. m. light showers of rain occurred (see figure). The heavy clouds automatically put a damper on the rapid heating of the ground, so that convection was no longer strong enough to keep up the initial intensity. As the lower air became warmer the height at which condensation began in the ascending currents became so great that even had light rain continued to fall from the clouds the drops would probably have evaporated before reaching the ground.

By 11 a. m. most of the cumulus domes were beginning to reach the alto-cumulus level, which was still moist after the evaporation of the clouds there only a few hours before. As the convectional columns began to disturb this moist layer the sky became dotted with lenticular clouds, most of which were soon entered and swallowed up by the cumuli (see figure). Many of the cumuli now had grown into cumulo-nimbi, and were spreading their flat tops above the other clouds. Soon some of the heads reached higher and produced caps in the next moist layer above—that is, in the cirro-cumulus level (see figure).

With the formation of cumulo-nimbus clouds the convectional currents had become established on such a scale that most of the small cumuli disappeared. Thus there were large clear patches; and, likewise there were showers of considerable area. This was to be expected, for the larger clouds not only called for larger areas of descending air, but also with their large shadows they cut off the warming of the ground. The spreading tops of the clouds in both the cirrus and cirro-cumulus levels, and also some disturbances at these levels, began to cover the sky with various forms of cirrus; while local spreadings of the large convectional clouds at a lower level, where there seemed to be a temperature inversion, added some sheets of alto-stratus and alto-cumulus. The cloudiness increased as these various sheet clouds spread out. An arc of a solar halo became visible. Streaks of falling rain were to be seen in several directions, five showers being distinguishable for an hour early in the afternoon (see figure). These would form, travel slowly northward, spread out, become thinner and evaporate—cloud first. One such brought a shower at College Station from 3:02–15 p. m.

After 3 p. m. disintegration was the rule. At about 3:30 a relatively cool breeze came from the northeast, apparently from under an evaporated shower. This seems to have caused some of the cumuli to evaporate, by interfering with the rising currents which sustained them. The bases of the cumuli for the time being moved from the east while their tops came from the south. The cirrus and cirro-stratus now covered half of the sky, and the cumulus clouds a third more. A thickening cumulo-nimbus top drove slowly overhead from the west-northwest; and as its shadow deepened, the cumuli disappeared until they were to be seen only around the edges where there were clear spaces. In the southeast, a line of cumuli marked the open sky beyond the cirro-stratus sheet over us.

[1] Details of the 49 cloud observations are given in the table at the end of this article The development of the clouds is shown schematically in the figure.

When the solar eclipse began at about 4:35 p. m. the cirrus and cirro-stratus clouds covered 0.4 of the sky and 0.2 more were covered by cumulus and cumulo-nimbus clouds. A large cumulo-nimbus in the north to north-northwest kept growing backward as fast as its top was blown eastward, and time and again its rising domes would be shrouded for a few minutes in delicate scarf clouds. Local movement in and under the cirro-stratus clouds resulted in occasional appearances of cirro-cumulus waves or patches. By 5 p. m. the amount of cirro-cumulus was about 0.1, if all the scattered patches could be added together. In the northwest to east, under the shadow of the top of the cumulo-nimbus centering in the north, a row of alto-cumulus began to form at 5 p. m. First these were smooth, isolated caps or patches, but when more rapid formation began at 5:20 p. m. they spread, and at the time of their maximum extent and thickness, 5:55 p. m., these clouds formed practically a continuous streak or roll of heavy alto-cumulus or strato-cumulus, covering about 0.1 of the sky. The amount of cirro-cumulus was variable. The cirro-stratus became somewhat thicker, perhaps only because of its movement, which brought thicker parts over. From 5:15 to 6:05 p. m. the sky was 0.9 covered, and at 5:45 p. m., 10 minutes after the maximum of the eclipse, the sky was almost totally overcast. The lowest temperature came 10 minutes later than this. From 5:47 to 6:08 p. m., in spite of the dimmed sun, there were arcs of both 22°- and 46°-halos, and, momentarily, a portion of a circumzenithal arc was seen. From 5:22–25 p. m., there was a third of a double rainbow in the southeast.

As the sun slowly emerged from behind the moon, the cloudiness gradually decreased, the cirro-stratus became thinner, the alto-cumulus gradually disappeared, and the cumulus clouds were rejuvenated. At the end of of the eclipse, about 6:38 p. m., the cirro-stratus and cirro-cumulus clouds occupied a little over half of the sky, and two-tenths more were covered with cumulus and cumulo-nimbus.

As the sun got low, the shadows in the northeast became heavy; and the alto-cumulus streak began to reappear at 7 p. m. A few minutes later the sun set behind the top of a cumulo-nimbus cloud. The cloudiness became 0.6 at 7:15 p. m. At that time, cumulo-nimbus or "false" cirrus clouds extended around the northern horizon from the west-southwest to east-northeast. In the west, some heavy masses of falling rain were silhouetted against the low light. When darkness was coming on at 7:30 p. m., the sky was only 0.4 covered—cirrus 0.1, cirro-cumulus 0.2, cumulo-nimbus 0.1, and a few alto-cumulus lenticulars. The heavy cumulo-nimbus clouds were slowly going to pieces; and now some five or six individuals could be distinguished. When the stars came out, some faint outlines of cirro-cumulus and a little cirrus haze could be seen.

The cloud transformations of this day were typical of June days, with "Gulf weather" 100 miles inland. There were some features, however, which may be ascribed to the reduction in sunlight during the eclipse: such as the formation and evaporation of the long line of alto-cumulus clouds, the rejuvenation of the cumulus clouds after the eclipse, and perhaps the increase and decrease of total cloudiness.

NON-INSTRUMENTAL CLOUD OBSERVATIONS, JUNE 8, 1918.

By CHARLES F. BROOKS.

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Ninetieth meridian time.	Level 1. Top of false cirrus; snow falling through Level 2. Movement from WNW.		Level 2. Base of minor inversion of temperature, 2 (?) km. below Level 1. Movement from WSW.		Level 3. Base of minor inversion of temperature, 4 (?) km. below Level 2. Movement from SSW.		Levels 4 and 5. Considerable stratum with uniform (?) temperature gradient. L. 4 from SSW. L. 5 from S. to E.		Total cover, tenths.	Remarks.
	Tenths of sky covered.	Kinds.	Tenths of sky covered.	Kinds.	Tenths of sky covered.	Kinds.	Tenths of sky covered.	Kinds.		
A. M.										
6	3+1	Ci.	oo	Ci.Cu.	1	A.Cu. & St.Cu.	0	None.	4	Overflow remnants.
7	2+1	Ci.		? (obscured ?).	4	St.Cu. & A.Cu.	0	None.	6	Do.
8	1+1	Ci.	oo	Ci.Cu.	0 (?)	None (?).	6	Cu.	7	1st Cu. at 7:25.
9	0 (?)	None (?).	0 (?)	None (?).	0 (?)	None (?).	7	Cu.Nb., Cu.	7	Light rain just after 9.
10	0	None.	0	None.	0	None.	5	Cu.	5	
11	0	None.	0	None.	oo	A.Cu.	?	Cu.	?	A.Cu. lenticulars.
11:30	0	None.	0	None.	oo+1	A.Cu.	6	Cu.	6	A.Cu. lenticulars and scarfs.
12	0	None.	0	None.	oo+1	A.Cu.	7	Cu.Nb., Cu.	7	Do.
P. M.										
12:33–12:38	oo	Ci.	oo	Ci.Cu.	1+1	A.Cu.	oo 3	Cu.Nb. Cu.	4	Light rain 12:15. Ci.Cu. and A.Cu. lenticulars and scarfs.
1:00– 1:05	oo+1	Ci.	2+1	Ci.Cu.	1	A.Cu. & St.Cu.	oo 3	Cu.Nb. Cu.	6	St.Cu. overflow from Cu.Nb.
1:30– 1:40	1+1	Ci. & Ci.St.	oo	Ci.Cu.	1	A.Cu. & St.Cu.	3 2	Cu.Nb. Cu.	7	Ci.Cu. scarfs. Halo 1:25–40, 45–50.
2:08– 2:10	1+1	Ci. & Ci.St.	0	None.	2 1	A.Cu. St.Cu.	1 2	Cu.Nb. Cu.	7	St.Cu.: evaporating Cu.Nb. 5 showers in sight.
2:31– 2:35	oo+2	Ci. & Ci.St.	oo	Ci.Cu.	2	A.Cu. & St.Cu.	2 4	Cu.Nb. Cu.	8	Some lenticular A.Cu. 4 showers in sight.
3:02– 3:13	oo+2	Ci.	0 (?)	None in sight.	3	St.Cu. & A.St.	3 (?) 3 (?)	Cu.Nb. Cu.	9	Light rain, 3:02–3:15.
3:35– 3:40	5	Ci. & Ci.St.	0	None.	1	St.Cu.	?	Cu.Nb. Cu. (base from east).	8	3 showers in sight. Cu. leaning E. or SE., slow anticyclonic cloud whirl.