September are months of harvesting and thrashing, followed by the preparation of the soil for fall-wheat sowing and the beginning of sowing. October is devoted to the completion of fall work in the field, and November and December to germination, a considerable growth sometimes being obtained ere the end of the quarter, for use as winter pasture. Upon the precipitation during the first quarter of the calendar year, and especially in February or March, depends to a great extent the prospects of the wheat crop; this might, perhaps, be termed the rooting season, for growth to the jointing stage is not permitted for fear of destruction by frost; spring-grain sowing is well advanced by the end of March. The wettest quarter of the year is April, May, and June, which constitute the growing season for all small grains, and the end of June usually witnesses the maturity of winter wheat and the close approach of the end of the oat and barley season.

Since irrigation water is not available in this section, and since no dependence can be placed upon the weather in July and August, which months are often dry and always hot in the daytime, the farmer relies principally upon produce that develops beyond danger early in the summer. It is necessary, however, to have fodder and hay with which to supplement buffalo grass pasturage in case of severe storms or scarcity of grass, and it is, therefore, customary to plant considerable corn, cane, and Kafir corn. Corn is planted, not with the expectation of securing a grain crop, though the profits from an occasional favorable season are perfectly acceptable, but for the more certain returns from its fodder. The most important hay crop in this region is alfalfa, to which all available bottom land is sowed, and from which three or four crops of hay are secured each season.

These remarks apply to southwestern Kansas, where the climate is different in many respects from that in other portions of the State. The much greater rainfall in the middle and eastern sections of the State permits the raising of immense corn crops in the most favorable seasons, and good crops in average seasons, as also numerous other agricultural products that can not be successfully grown in the western portion of the State.

## DETAILED CLOUD OBSERVATIONS IN COLORADO.[1]

By J. B. WILLSEA, Voluntary Observer, Fruita, Mesa County, Colo., dated February 10, 1904.

For a dozen years past almost all the relaxation I have enjoyed has been in studying the clouds, but without the aid of teachers, books, or instruments. This is my only excuse for writing you. One of your assistants may find a kernel of grain in the chaff I present and be able to use it in his own special line. I never saw any of the facts mentioned below in print, nor heard them from others.

The top of a fleecy cloud leans in the direction it is traveling, because the top travels faster than the bottom, it being less affected by the friction of the air against the earth's surface.

The sun's rays sometimes seen in the east at about sunset, converging at a point diametrically opposite the sun, are parallel, and are lights and shadows of clouds in the whole sky and of mountain peaks and ridges, in this locality, projected through the atmosphere to its outermost visible limits, but the rarity of the upper air and its freedom from color prevent apparent focusing of the rays in the east.

The motion of a cloud in a vertical direction is sometimes quite rapid, for I have watched a fleecy cloud rise from the hillside and within an hour become a high cirro-cumulus.

When a rain cloud is rapidly rising, the under side is frequently covered with small, curling masses of vapor, especially in showery weather, resembling in shape the swirls or boiling of the water in the wake of a steamer. Of course this indicates a rising barometer, but I have no means of determining whether a cloud is approaching the earth or not, save by its increasing density.

I have never seen a cumulus cloud increase in size at the bottom; the increase was always at the top. Cumulus clouds sometimes rise to an immense height, cirro-cumulus appearing far below them.

The reflection of a cloud in a still lake appears larger than the original cloud.

In looking at a colored sunset, if the head is inclined so far to one side that the eyes are upside down, the colors appear much more brilliant.

The appearance of the clouds at a distance, where by reason of the curvature of the earth they touch the horizon, proves the sphericity of the globe. Otherwise the clouds would appear smaller and smaller until they became telescopic; but they do not.

The sphericity of the earth is shown by the sunset tints lingering much longer in the northern part of the horizon in the summer and in the southern part of the horizon in the winter than would be the case if the shape of the earth were not spherical. We can see the longer day to the north of us at sunset in summer and the same to the south of us in winter. I do not refer to the clouds, but to the tints of the clear sky, visible to a great distance.

At morning and at night at certain seasons of the year, there is seen apparently a portion of a cloud hanging down from the main cloud something like a beard, and resembling rain, but not having the even, clear, direct lines of descending rain seen at a distance. It puzzled me for years, but on seeing the phenomenon with tall cliffs as a background, I saw that the precipitation left the cloud as snow, but was melted to rain long before it touched the earth, perhaps even evaporating before reaching the ground. This occurs when much of the sky is clear and with isolated clouds mostly, where the clear sky furnishes a good background for observation.

I find that the thermometer shelter used by the cotton-belt observers has one fault; the rain fills the horizontal crack at the top of the door, and at night time the door freezes fast to the casing, so that damage is done in opening it. I have had no further trouble since I bevelled off the top of the door a little, thus allowing the rain to flow away.

[1] Although many of these observations are not new to meteorology, yet the whole article is in the right direction, and we can only hope that Mr. Willsea may continue to observe and elucidate the important cloud phenomena.—ED.

## MIDWINTER WEATHER CONDITIONS IN WESTERN ONTARIO.

By A. G. SEYFERT, Stratford, Ontario, dated January 26, 1904.

Not within the memory of the oldest inhabitant has western Ontario experienced such an unprecedentedly severe winter as this. Instead of the usual autumn rainfall, fine weather prevailed up to the middle of November, when it turned cold and commenced to snow, and has continued almost incessantly to the present time. Four feet of snow on the level and drifts in many places four times that depth result. Country roads are blockaded, and communication almost entirely cut off. Railroads are in but little better condition. The main lines are kept open, but many of the branches are completely snowed under and abandoned for the present. Every effort is being put forth in fighting the elements to keep the roads open, but never did such conditions prevail since railroads were first built in this province. The high winds, the intense cold, and the enormous quantity of snow are more than human agencies can overcome. The local papers are full of details of all sorts of accidents and fatalities attributable to the weather conditions. Roofs breaking down from the weight of the snow, people frozen to death within sight of their homes, freight trains loaded with live stock in snow drifts until the strongest

animals only survived; is the tale that could be prolonged indefinitely.

During the two and a half months of this remorseless climate the mercury has been but once or twice above the freezing point, and for days many degrees below zero all day. One of the most serious features of this condition of affairs is the water famine with which most of the farmers have to contend. The rainfall had been below the average when the winter set in, and since then none has fallen, and the water supply of most of the farmers is exhausted, causing great inconvenience and in many cases much suffering.

February is usually the worst winter month in this latitude, and if this is the case this year untold privations will have to be endured before the end is in sight.

## A WEST INDIAN STORM.

By Mr. JOHN S. QUIN.

Mr. John S. Quin, Editor of the Avis, Christiansted, St. Croix, sends the following relative to a disturbance of moderate intensity, No. VIII on Chart II of the MONTHLY WEATHER REVIEW for October, 1903. On that chart the track is given from Cuba to New Foundland. With regard to its previous history, Mr. Quin says:

There was a normal condition of the atmosphere up to Tuesday morning, October 20, for cirrus clouds were seen coming from about northwest. But by noon on Wednesday, October 21, an important change had taken place, for through the spaces among the lower and middle clouds, which were then accumulating in heavy masses, a layer of high clouds (cirro-stratus) could be seen moving slowly up from about south. This motion of the high clouds made it highly probable that a cyclone center had been formed, or was forming, toward the south. And the evidence of the high clouds was strengthened by that of the lowest clouds, which were moving rather fast from east-southeast, and thus, when taken with the other signs, indicated a cyclone center to south-southwest; which was probably its actual position at that time. The subsequent course of the weather harmonized with these conclusions, for by noon on Thursday the wind had gone round to south, and it was coming from the same quarter on Friday morning, with much cirro-stratus coming from the west. By noon on the same day the wind had gone round to south-southwest, and in the afternoon was even a little farther round toward southwest. As darkness approached, however, it was very interesting to notice how a layer of middle clouds (alto-stratus), which was coming slowly from southwest by west, gradually became still slower till hardly any motion could be seen in it. The night settled down in a calm, and the early morning (Saturday) showed the lower clouds moving from south-southeast. Hence, we concluded that the cyclone had left us and that the wind was falling back to its normal direction. It continued to fall back, till, on Sunday morning, it was blowing very gently from east, or, to speak more accurately, the clouds were moving from the east while the wind (surface wind) had gone round so far as to blow from east-northeast. The evidence of the barometer readings had in the meantime kept pace with the evidence of the wind changes, as will be seen from the table below.

Now comes the very interesting question: Did this depression originate in the Caribbean or did it come from the Atlantic? Considering the apparent absence of evidence from the island reports, we were at first inclined to the former opinion, but after arranging the evidence so as to take a bird's eye view of it, we are obliged to come to the conclusion that the depression passed in from the Atlantic, but in so mild a form as at first to have escaped notice. We are inclined to believe, also, that the movement increased in force as it went on, and that it made a special advance in strength on Wednesday. To this point, however, we will return later. We would now ask the attention of the reader who has followed us thus far to the table below, where we give the barometer readings and wind directions for the three islands, Santa Cruz, Antigua, and Barbados. Of these three islands, Barbados is farthest to windward and Santa Cruz farthest to leeward, while Antigua lies between. A cyclone center following the usual direction would have to travel nearly 300 miles in passing from its nearest point in regard to Barbados, to its nearest point in regard to Antigua, and would then have to travel a little over 200 miles more before making its nearest point to Santa Cruz. Now, if we examine the figures given in the table, we shall see that the lowest morning reading for each place (*the figures in italics*) show a progressive movement from east to west. For Barbados it was on *Monday*, for Antigua on *Tuesday*, for Santa Cruz on *Wednesday*. The table seems then to prove that the *barometrical depression* was not formed in the Caribbean, but over the Atlantic, and that it moved from the latter into the former.

But is there any evidence of a cyclonic movement? If we use the word cyclone as meaning hurricane, certainly it is obvious that there was nothing of the sort; but if we use it in its proper sense, as meaning a rotary movement of the air, then there is some evidence for it. At Barbados we notice that the wind on Saturday morning (17th) was east-northeast, but by Monday morning, when the barometer had reached its lowest point, it was east-southeast, and the following morning it was from southeast. This was a true cyclonic behavior of the atmosphere, and we can now see that the depression passed on the south side of Barbados. The force, however, must have been extremely weak, for we see no more of its effects among the islands to windward till we come to the south wind in Antigua on Thursday and Friday. That wind was doubtless a portion of the cyclonic movement, the center being then far away to the west. In Santa Cruz the cyclonic movement was well marked during the latter part of the center's passage, say Wednesday to Friday, when it was passing south of us, and afterwards was moving off to the northwest.

The reader is now referred to the table, which shows the wind directions as well as the morning readings of the barometer. Where two directions are given for one day, the upper is from the morning report and the lower from the afternoon report.

*Morning readings.*

| Date. | Santa Cruz, 8 o'clock. | | Antigua, 9 o'clock. | | Barbados, 10 o'clock. | |
|---|---|---|---|---|---|---|
| | Pressure. | Wind direction. | Pressure. | Wind direction. | Pressure. | Wind direction. |
| Saturday, October 17 | 30.04 | ese. | 30.04 | e., ne. | 30.13 | ene., e. |
| Sunday, October 18 | 30.04 | e. by n. | ..... | ..... | ..... | ..... |
| Monday, October 19 | 29.98 | e. | 29.94 | e. | *30.05* | ese., s. |
| Tuesday, October 20 | 29.96 | e. | *29.92* | e. | 30.06 | se., ese. |
| Wednesday, October 21 | *29.94* | ese. | 29.94 | e. | 30.08 | se. |
| Thursday, October 22 | 29.97 | ese., s. | 29.97 | s., se. | 30.12 | ese., s. |
| Friday, October 23 | 30.00 | s., ssw. | 30.02 | s., e. | 30.17 | se. |
| Saturday October 24 | 30.03 | sse. | 30.03 | e. | 30.16 | se., e. |

Lastly, we return to the question: Did the force of the movement increase on Wednesday, the 21st? It was probably gathering strength all the time of its passage, and the fact that the outward flow of the higher air from the center was not detected here till Wednesday may be explained, at least in part, by the fact that its center had not till then arrived at its nearest approach to us. On the other hand, there is the curious fact that on Wednesday morning the barometer here fell from 29.94 at 8 a. m. to 29.87 at noon, an unusual fall, since under ordinary circumstances the reading at noon is about the same as at 8 a. m. A still more interesting fact is that at Antigua and Barbados the afternoon readings on Wednesday showed two-hundredths and seven-hundredths, respectively, below the afternoon readings of the previous day, notwithstanding the fact that at both islands the barometer had started to rise. To make this matter as clear as possible, we give a table of the afternoon readings of the barometer at Antigua and Barbados.

*Afternoon readings (4 o'clock).*

| Date. | Antigua. | Barbados. |
|---|---|---|
| Friday, October 16 | 29.98 | 30.04 |
| Saturday, October 17 | * | 30.04 |
| Monday, October 19 | 29.83 | 29.93 |
| Tuesday, October 20 | 29.85 | 29.97 |
| Wednesday, October 21 | *29.83* | *29.92* |
| Thursday, October 22 | 29.89 | 30.05 |
| Friday, October 23 | 29.98 | 30.10 |
| Saturday, October 24 | * | 30.09 |

* Not given.

Perhaps, after all, it would be a mistake to attach much importance to this small fall; still it is well worth notice.

If, then, we wish to make a picture for ourselves of the weather conditions in this part of the world last week, we must first think of a wide area of sea out in the Atlantic, but near to our islands, over which the air was rather lighter than over the surrounding parts. This wide area gradually advances on us during the first days of the week and fills up the eastern part of the Caribbean Sea. By Wednesday we get evidence that a cyclonic center has been formed, and we see from the motions of the wind that this center subsequently advances toward the northwest. On Wednesday it is nearest to us, but by Saturday morning it has withdrawn itself, and the usual fine weather returns. Whether this center, which has thus passed us and traveled onward, has been very stormy or not, can not yet be told, perhaps never will be, for unless its force has grown so much as to assume a destructive character no one will notice it. For us in St. Croix the movement has been one of immense value, bringing us, in the form of heavy and long expected rains, just what was wanted to insure for us in regard to our staple industry a fairly good position in the coming year.

## CLIMATOLOGICAL TABLES FOR MERZIFOUN, TURKEY.

By Prof. J. J. MANISSADJIAN, dated Anatolia College, Merzifoun, February 26, 1904.

In continuation of tables published in the MONTHLY WEATHER REVIEW for January, 1903, p. 25, I take pleasure in presenting the following summary of monthly and annual values observed by myself at the observatory of Anatolia College, Merzifoun, latitude 40° 51′ north; longitude 35° 31′ east, altitude 751 meters, or 2646 feet.