

that we can form some working idea therefrom of general meteorological processes. But let us consider whether we have even attempted for surface meteorology what the patience of astronomers from Copernicus to Kepler did for astronomy.

Do we yet fully comprehend the kinematics of the travelling depression; and if not, are we in a satisfactory position for dealing with its dynamics? I have lately examined minutely the kinematics of a travelling storm, and the results have certainly surprised me and have made it clear that the travelling depressions are not all of one kinematical type. We are at present hampered by the want of really satisfactory self-recording instruments. I have sometimes thought of appealing to my friends the professors of physics who have laboratories where the reading of the barometer to the thousandth of an inch belongs to the work of the "elementary class," and of asking them to arrange for an occasional orgy of simultaneous readings of the barometer all over the country with corresponding weather observations for twenty-four consecutive hours, so that we might really know the relation between pressure, rainfall, and temperature of the travelling depressions; but I fear the area covered would even then hardly be large enough, and we must improve our self-recording instruments.

Then, again, have we arrived at the extremity of our knowledge of the surface circulation of the atmosphere? We know a great deal about the average monthly distribution, but we know little about the instantaneous distribution. It may be that by taking averages we are hiding the very points which we want to disclose.

Let me remind you again that the thickness of the atmosphere in proportion to the earth's surface is not unsatisfactorily represented by a sheet of paper. Now it is obvious that currents of air in such a thin layer must react upon each other horizontally, and therefore we can not *a priori* regard one part of the area of the earth's surface as meteorologically independent of any other part. We have daily synoptic charts for various small parts of the globe, and the Weather Bureau extended these over the Northern Hemisphere for the years 1875 to 1879¹; but who can say that the meteorology of the Northern Hemisphere is independent of that of the Southern? To settle that primary question we want a synchronous chart for the globe. As long as we are unable to watch the changes in the globe we are to a certain extent groping in the dark. A great part of the world is already mapped every day, and the time has now arrived when it is worth while to consider what contributions we can make towards identifying the distribution of pressure over the globe. We may idealize a little by disregarding the local peculiarities without sacrificing the general application. I have put in the exhibition a series of maps showing what approximation can be made to an isochronous chart of the globe without special effort. We are gradually extending the possibility of acquiring a knowledge of the facts in that as in other directions. With a little additional enterprise a serviceable map could be compiled; and when that has been reached, and when we have added to that what the clouds can tell us, and when the work of the aeronautical committee has so far progressed that we can connect

the motion of the upper atmosphere with the conditions at the surface, when we know the real kinematics of the vertical and horizontal motion of the various parts of a travelling storm, we shall, if the universities will help us, be able to give some rational explanation of these periodic relations which our solar physics friends are identifying for us, and to classify our phenomena in a way that the inheritors of Kepler's achievements associated with us in this section may be not unwilling to recognise as scientific.

CLIMATOLOGY OF COSTA RICA.

Communicated by Mr. H. PITTIER, Director, Physical Geographic Institute.

[For tables see the last page of this REVIEW preceding the charts.]

Notes on the weather.—On the Pacific slope the rains were very inconstant, being superior to the normal in some instances and inferior in others. In San José the pressure was markedly above the normal, while temperature was slightly low, with the exceptional minimum of 55.0° on the 25th (the lowest temperature observed heretofore in this month was 55.9°); the relative humidity was also less than the mean. The rainfall, 9.83 inches, occurred almost entirely during the afternoon hours, and was distributed pretty evenly through the month. Sunshine, 187.55 against a normal of 150.42. On the Atlantic slope the rainfall was markedly deficient on the coastal plains, and generally abundant in the valleys and mountains of the interior.

Notes on earthquakes.—September 19th, 5^h 33^m a. m., pretty strong shock NE-SW., intensity III, duration 4 seconds. September 24th, 2^h 53^m, a. m., slight shock NW-SE, intensity II, duration 8 seconds.

THE HURRICANE SEASON.

By ENRIQUE DEL MONTE, Chief of Central Station, Havana, Cuba.

[Translation of a circular letter from the Central Meteorological Station of the Republic of Cuba, dated July 23, 1903.]

It is well known to all that the hurricane or cyclone season of the Antilles embraces a period variable from one year to another, and that the period of duration also varies with regard to its beginning and its ending, although the date of the latter is subject to more regularity than that of the former.

In fact in some years the cyclonic activity manifests itself in June (and even in May, as it happened in 1889), and continues until the end of October; in other years it begins in July and even in August, but terminates in October. This does not mean that every year there will be hurricanes which pass more or less near to us. Some years are recorded in which there has not been any real cyclonic activity, although this is rarely the case; thus during the past year there were no storms that properly deserved the name of hurricanes.

Up to this date the cyclonic activity has not commenced this year, nor does the upper current of the atmosphere appear to indicate that its beginning is near, although conditions may afterwards vary with relative rapidity and may almost unexpectedly inaugurate the hurricane season.

But whatever may be the date at which cyclonic activity begins, tropical hurricanes in their progress are subject to the two following empiric laws:

1. The place of formation of a hurricane is variable, being intimately connected with the time of the year in which storms originate.

2. The hurricane once formed advances in a route or trajectory that varies both with the different periods of the cyclonic activity and with geographical latitudes.

The practical generalization of the two laws we have just mentioned is due to the sagacity and perseverance of one of the highest authorities of modern times in matters relating to hurricanes of the Antilles (we allude to the deceased Father

¹ The Bulletin of International Simultaneous Meteorological Observations was published daily, with a monthly summary, from January, 1875, to December, 1883. The monthly summary alone was continued to December, 1889; it was continued in the MONTHLY WEATHER REVIEW to December, 1895, with the Atlantic Ocean storm tracks. The latter have been kept up by the United States Hydrographic Office and published on the monthly Pilot Charts to the present date. The daily weather maps for the Northern Hemisphere were published with the Bulletin from January, 1877, to November, 1883, but have been preserved in manuscript from January, 1875, to December, 1896, by the Weather Bureau, and since that date by the United States Hydrographic Office. The monthly charts of isobars, isotherms, and wind and storm tracks were published by the Weather Bureau up to December, 1889. The ten-year summary for the years 1878-1887, inclusive, was published as Bulletin A by the Weather Bureau in 1891.—[Ed.]