THE ORIGIN AND COURSE OF WEST INDIAN HURRICANES.

By JOSÉ CARLOS MILLÁS.

[Author's abstract.]

In this paper the results obtained by Father Viñes and the data of the recent investigations carried out by the meteorologic service of the United States are made use of in the study of the above topic. The author thus determines the regions most frequented by this class of cyclones. He points out the fact that there are several anomalies which indicate great variation in the causes and suggests that these variations be studied. The only definite statement the author makes in regard to the causes is that these storms have their origin in a parabolic zone which extends from the Cape Verde Islands to the Gulf of Mexico. He also notes that at the beginning of the hurricane period, the points of origin tend to be in the western part of the zone, while in the middle of the season, at the time of greatest frequency, the points of origin are more likely to be in the eastern part.

The author then takes up the problem of the origin and course of hurricanes. He says that from the theories that attempt to explain the formation of the phenomena arises the modern tendency to ascribe the initial moment of the cyclone to the dynamic hypothesis. He believes that many tropical storm phenomena are better explained by a modified hypothesis of condensation.

He calls attention to the solution proposed by Davis: Solar energy which gradually accumulates in the interior region of the atmosphere; the calm preceding the gyratory movement and the influence of the rotation of the earth. To these he adds the influence of opposing currents of different temperatures. He thinks that the opinion of Bigelow also must be considered. That the first movement of the whirl takes place in the upper strata in the zone between the high stratus and the cirrus.

From these considerations he draws the conclusion that the problem is far from being solved.

The author raises the following questions: (1) Does the gyratory movement descend or ascend? (2) If it ascends, does it always find suitable conditions for its development? (3) If it ascends, do the upper currents always provide the necessary elements for its development?

On taking up the course of hurricanes the author indicates what the normal path is in the different epochs and lays down practical rules to guide the observer. He considers also the forces which drive the storm in its parabolic course, one of which, the upper current, appears to have a special influence.

Finally he considers the course from the mathematical point of view, arriving at the conclusion that up to the present time the results of the studies made are more imaginary than real.

INVESTIGATIONS OF FORECASTS OF BAROMETRIC VARIATION.

By SIMÓN SARASOLA, S. J.

[Author's abstract.]

The author begins by establishing the fact that every rational forecast of the weather must depend upon a prediction of high and low pressure, since otherwise there can be no solid basis for a forecast. In the development of this proposition he reviews the different methods employed in the formulation of forecasts.

The author then turns to his personal investigations in this field. The periodicity of barometric variations may be studied from two points of view: (1) Examining the maximum and minimum pressures in a given locality to discover whether there really exists a periodic law by which it is possible to forecast the day on which the barometer will rise or fall; (2) studying the variations of pressure by means of the weather map over extensive regions.

The author believes that the forecasting of changes in atmospheric pressure may be made use of in relation to the hurricanes of the West Indies and he makes a brief reference to the isobaric method, formulating the following propositions: (1) "Atmospheric pressure suffers a periodical change. The approximate value of the period is 30 days; (2) the depressions, whether deep or not, appear periodically. The tendency to fall is noticed every 20 days." To prove these propositions the author gives a table of the most important hurricanes which have occurred from 1896 to 1915 in the West Indies, indicating the barometric readings in the Observatory of Belén in Habana.

The author says that it is possible to calculate when the barometer will fall, but not how much, and that on the day when this may be calculated with exactness the problem of barometric variations will be solved. He says that with his method he has been able to forecast with precision during the last 10 years the day on which the barometer would fall and when it would begin to rise. In this connection he refers to the cases published in the annals of the Observatory of Montserrat, No. 1, page 32.

The author next considers the method applied to the weather maps, especially those of Washington. He believes that the HIGH and LOW shown on these maps do not always indicate notable atmospheric disturbances, it being necessary many times to consider them in relation to the barometric reading of the nearest station; nor are they of special interest in the study of the depressions of some intensity. In his opinion the work of the Weather Bureau of the United States in the study of the course of cyclonic disturbances, their different types, etc., is very useful and helps to form an idea of the greater or less probability of the appearance of depressions in a given region.

ATMOSPHERIC ELECTRIC OBSERVATIONS ABOARD THE "CARNEGIE," 1915.

By W. F. G. SWANN.

[Author's abstract.]

This paper treats of the instrumental equipment and results of the observations made aboard the magnetic survey vessel, the *Carnegie*, of the department of terrestrial magnetism of the Carnegie Institution of Washington, during the portion of her 1915 cruise extending from Brooklyn to Alaska, via Panama and Honolulu.

The atmospheric-electric measurements aboard the *Carnegie* are as follows:

(1) The potential gradient.

(2) The conductivities λ_+ and λ_- arising from the positive and negative ions, respectively.

(3) The numbers of positive and negative ions per cubic centimeter (n_+ and n_-).

(4) The radioactive content of the atmosphere.

(5) The radioactive content of the sea water.

(6) The number of ions (R) produced per cubic centimeter per second in a closed vessel.

The following meteorological observations are made; Pressure, temperature, and humidity. The diurnal variations of the potential gradient, conductivity, and ionic content are also under investigation.

For potential-gradient measurements, the apparatus employed comprises a long brass tube, carrying a parasol attachment at one end, and mounted on insulated bearings fixed to the stern rail of the ship, so that it may be turned in a vertical plane containing the fore-and-aft line. Relative values of the potential gradient are obtained by measuring the alteration in potential which the insulated system undergoes when it is turned through a fixed angle from an earthed position.

For measuring the conductivity, the method of Gerdien, somewhat modified, is employed, and for measuring the ionic content a modification of Ebert's ion counter is used. The quantity R is obtained from the saturation current measured in a closed vessel, and the radioactive content is deduced from observations on the amount of active material collected in a given time when air is drawn through the space between two concentric cylinders, the central member of which is raised to a high negative potential.

The results for the Pacific Ocean are naturally the more interesting since here the vessel was on the average a considerable distance from land. The mean 9:30 a. m. value of the potential gradient over the Pacific Ocean is 116 volts per meter, while the mean value for the same time of day and year as obtained from nine land stations, is 149 volts per meter. The mean values of $n_+ + n_-$ and $\lambda_+ + \lambda_-$ are, respectively, 1,600 and 2.91×10^{-4} e. s. u., which are somewhat larger than the values 1,480 and 2.29×10^{-4} e. s. u. corresponding to the means for several land stations. The mobilities of the positive and negative ions are respectively 1.3 and 1.4 cms. per second per volt per cm.

The radioactive content of the air over the Pacific Ocean forms only about 2.5 per cent of the average value over land and is too small to be of any appreciable influence in determining the number of ions per c. c. The value of R for the Pacific Ocean is 3.9, and is more than sufficient to account for the observed ionization, but uncertainty must necessarily exist as to the portion of this amount attributable to the vessel itself.

The most striking feature presented by a comparison of the ionic content over land and sea is that the former is no greater than the latter in spite of the known extra cause for ionization to be found in the radioactive material in the former case. It is suggested that the greater rate of production of ions over the land is more than offset, as regards the measured ionic content, by the greater proportion of the ions which are there converted to the slowly moving, unmeasured type, by combination with dust nuclei.—*W. F. G. S.*

THE WEATHER AND CLIMATE OF SALT LAKE CITY, UTAH.

By ALFRED H. THIESSEN.

[Author's abstract.]

The climate of Salt Lake City, Utah, is interesting in many points—the relatively high annual mean temperature, mild winters, hot but agreeable summers.

Salt Lake City is 4,300 feet above sea level, protected by mountains on its north and east sides. The mean annual temperature is 51.7° F. The highest temperature ever observed was 102° and the lowest −20° During 41 years of records there were only 5 years when maximum