

FATHER JOSE ALGUE, S.J., AND MICROSEISMS*

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HERE is an interesting item which I think will bear publication. Some time ago, Father J. R. Goberna, S.J., of the Belén Observatory in Havana, wrote to our observatory, conveying the interesting fact that Father Algué as early as 1910 had written a paper for the Paris Exposition of that date on the subject, "Microseisms and the Position of Typhoons." He says that all Spanish writers give credit to Father Algué for his very early work on microseisms and typhoons. It is to be remarked that Father Algué's work on this subject was begun much earlier than 1910. If we look in the second (revised) edition of his book *The Cyclones of the Far East* (Manila: Bureau of Public Printing, 1904) and turn to Part II, chapter x, pages 184-187, we find a chapter entitled, "Microseismic Movements as an Indirect Precursory Signal of a Cyclone." Its very first paragraph is arresting. It reads:

"On writing of the cyclones of 1894 (*Baguios ó Tifónes de 1894*, Manila, 1895, p. 79) we said:

" 'We call attention to the intimate relation there appears to be between the resistance offered to the cyclonic winds by mountain ranges and the microseismic movements.

" 'A notable fact points out this relation. In the adjoining map of Luzon (Plate XLVIIa) the track of a cyclone has been divided into parts corresponding to the movement of the storm for every two hours. In the lower part, the curve A represents the velocity of the wind in meters per second; the upper curve, B, represents the microseismic movements observed on the Bertelli tromometer; each division represents an angle of 14 seconds.

" 'Examining the curves we note the following important facts:

" '1) The greater or less amplitude of the oscillations does not depend on the greater or less force of the wind in the locality; for in the cyclone the maximum oscillation of the tromometer was observed at 12:30 A.M., whereas the maximum velocity and force of the wind was not observed until nine hours later.

" '2) The mean value of the microseismic oscillations is incomparably greater while a cyclone is crossing land than when it is crossing the sea.

" '3) The greatest oscillations are observed when the cyclone is passing the great mountain ranges.

" 'From these facts it would appear that the enormous resistance offered by the mountains to the cyclonic winds which blow, at the approach of a cyclone, from the fourth quadrant, almost perpendicular to the range of mountains in the district of Príncipe, causes a huge mass of the earth's crust to vibrate, and the vibrations thus caused, being transmitted to a distance, are made per-

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ceptible by the great sensitiveness of the Bertelli tromometer. The effect of the wind blowing against the mountains of Zambales is also perceptible in the same instrument!"

Whatever we may say concerning the mountains' vibration as a cause of microseisms, it is evident that at least from 1894 Algué linked microseisms with typhoons. In fact, his next sentence in the chapter just quoted reads: "In the tables published from time to time in the *Monthly Bulletin* of the Observatory may be seen numerous examples of this relation between the microseismic movements and the course of a cyclone." Also: "Observations with the tromometer are made every hour of the day and night and have been continued since 1884."

To show how up-to-date Father Algué was, he even then urged the setting up of a network of tromometer stations in the Atlantic and Pacific. The pertinent passage (p. 187) reads: "The experience gained from the effect of cyclones on the microseismic apparatus of the Manila Observatory could help us in choosing the most suitable places for the installation of tromometers as an apparatus giving indications of the existence and approach of tropical cyclones. If tromometers were installed in the following places great good would doubtless result from the meteorological point of view: Havana, in the Antilles; San Juan, on the island of Puerto Rico; the islands more to the east of the Gulf of Mexico; the ports of the United States on the Atlantic coast, especially that of Florida; the ports of the Gulf of Mexico; and the ports of China and the south of Japan."

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