A VERY DEEP EARTHQUAKE IN THE PHILIPPINES

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The general interest now shown by seismologists in deep earthquakes prompted the writer to investigate their occurrence in the Philippine Islands. An examination was made of all seismograms on file in the Manila Observatory subsequent to 1911, the date of installation of the Wiechert Inverted Pendulum.

Among those found which had the appearance of considerable depth, that of April 8th 1929 was selected for investigation because the International Summary gave an epicenter and the depth of focus, and the data seemed to be fairly copious.

MATERIAL. Thirty observatories responded to the request for seismograms and three sent information that their records did not show sufficient amplitude to be of any value. It is believed that helpful data have been lost to the investigation by the failure of some observatories to transmit their records or copies. In addition to the above seismograms there were available at Manila the records of the Wiechert, Vicentini and Horizontal Pendulums of Manila and the Wiechert record of Butuan.

MACROSEISMIC DATA. This was very sparse. The earthquake was reported as having been felt slightly at Lais, southeastern Mindanao, and moderately in Butuan, northeastern Mindanao. It is not believed that the perception was actually confined to these places only. The epicenter is in a mountainous Moro district from which little information is obtained.

THE EPICENTER. The International Summary placed the epicenter at 7° 48′ North and 124° 36′ East and the time at origin $10^h\ 16^m\ 48^s$, G.M.T. This is a location which has not been known as an earthquake area and the writer was skeptical about the accuracy of the determination.

A misinterpretation of the Butuan seismogram led to the location of an epicenter in Butuan Bay and distances to all observatories were calculated. A reëxamination of the Butuan seismogram showed that the first motion was in a general NE–SW azimuth, and the fact that the first motion at Manila was a compression led to the adoption of the epicenter given by the International Summary.

The calculations based on the Butuan Bay position were not valueless. After the P–curve had been drawn as of the International Summary position, a slight shift of the distances to suit the Butuan Bay position showed that they were less satisfactory, especially in the early parts of the curve.

FOCUS. The International Summary gives the focal depth as 0.09R, which is 573 km, and the time at focus as $10^h\ 16^m\ 48^s$. The present investigation gives a focal depth of 585 km and the time at focus at $10^h\ 16^m\ 53^s$. The details are to be found in the subsequent sections of this paper.

THE TRAVEL TIME CURVES. The epicentral distances and the time at focus were taken from the International Summary. The times of P as given by the Summary agreed very well with the values read by the writer from the original records or contact copies. Where these were not available the times were taken from the Summary.

Other phases not given in the Summary were read from the records. The plotting of the times of S and other observed phases showed that in some cases there were mis-