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ATTENUATION OF INTENSITY WITH EPICENTRAL DISTANCE IN THE PHILIPPINES

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ABSTRACT

With data from 83 earthquakes in the Philippine region, an intensity attenuation equation is derived in the form: $I(R) - I_0 = 4.01 - 0.015\,R - 2.40 \log R$. This compares very favorably with results for a tectonically similar region, the San Andreas region, derived by Howell and Schultz (1975).

INTRODUCTION

A knowledge of how ground acceleration or velocity attenuates with epicentral distance is essential to the estimation of seismic risk at a given site. In the virtual absence of instrumental data, this attenuation function for acceleration or velocity may be obtained indirectly in two steps: first, through a study of how felt-intensity attenuates with epicentral distance; and second, through an empirical correlation of felt-intensity with acceleration or velocity. This study is concerned with only the first step.

INTENSITY DATA

Eighty-three earthquakes in the Philippine region, from 1870 to the present, have been found suitable to provide the needed data. Forty-six of these were from Maso's (1895) isoseismal maps covering the years 1870 to 1889. Sixteen earthquakes were from Minoza *et al.* (1961) spanning the years 1949 to 1959. The rest of the data were from various UNESCO, EERI, and PAGASA reports (see "References") covering the years 1960 to 1976.

The intensity scale traditionally in use in the Philippines has been the Rossi-Forel scale. Intensity data in Maso' were given in a local scale of maximum VI. The correspondence of this with the Rossi-Forel scale, given in Maso', is shown in Table 1.

The 83 earthquakes are distributed according to I_0 as follows

I_0	9–10	8–8.5	7–7.5	6–6.5	5
no.	5	24	1	48	5.

Following the well-known correlations between I_0 and M_L given by Gutenberg-Richter (1942, 1956), the earthquake magnitudes would range from 4.3 to 7.5.

PROCEDURE

A standard procedure in the regression analysis is to fit through the data points, $I_i(R_i)$, a least-squares curve of the form

$$I(R) - I_0 = a - b\,R - c \log R. \tag{A}$$

The coefficient b is related to the absorption factor while the coefficient c is associated with the geometrical spreading factor (Howell and Schultz, 1975). The least-squares conditions give three normal equations in a, b, and c. For better control of the fluctuations of the solutions, a simplification or modification was introduced,