



Attenuation of MM intensities for intraplate earthquakes in Brazil: Application to evaluate historical seismicity

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Abstract

Intensity data is a qualitative description of the effects observed from an earthquake, usually ranked in terms of how strong it was felt and the amount of damage. Despite its qualitative nature, intensity data is important to study both historical and recent earthquakes, such as in earthquake hazard studies. Magnitude of historical earthquakes in Brazil have so far been determined with magnitude x felt area relations. Intensity attenuation equations (decay of intensity as a function of magnitude and distance) have been determined in several portions of the world as they are intrinsically dependent on the crustal tectonic characteristics. Two approaches are commonly used: equations that fit the raw intensity values, or equations that fit the average isoseismal radius. We determined by least squares an equation fitting raw intensity data from 20 earthquakes in Brazil and neighboring intraplate areas, in the magnitude range 3.5 to 6.2 mb and hypocentral distances up to 720 km.

The best attenuation model (rms residual of 0.82) was $I=1.11M-1.63\log R-0.00104R+1.71$ where M is the magnitude (mb) and R the hypocentral distance. The preliminary uncertainties estimated for the epicenter and magnitude are, respectively, around ± 50 km and ± 0.5 mb for events with 30 or more intensity points.

We tested the new equation with intensity data from the Venezuela earthquake of 2018-08-21 21:31:40 UTM with teleseismic short-period magnitude of 6.9 mb (USGS/ISC). The fit was reasonable (standard deviation of 0.73), especially considering that the event was felt to distances up to 3450 km and had a magnitude higher than the ones used to determinate the equation. Further tests of the equation will be presented. We also plan to re-evaluate the epicenter and magnitude of Brazilian historical events.

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