



Modified Mercalli Intensity Values due to different interpreters: an automatic approach

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Abstract

The Sentiu Aí? system was implemented in 2015 by the USP's Seismology Center and has already received more than 1000 reports of possible felt earthquakes. Like others, it consists of a questionnaire based on the Modified Mercalli Intensity Scale of 1931. Since 2016 a method to automatically estimate the intensity of earthquakes has been developed and intensities were estimated for significant earthquakes felt in Brazil, like Maranhão (Jan/2017), Tupã/SP (Jul/2018) and Venezuela (Aug/2018). The methodology consists of assigning one probability reference histogram to each alternative of the 13 multiple-choice questions used by the system. Reference histograms are the interpretation of the scale and encode the most probable intensity associated with the answer. The final intensity is the result of stacking all considered answered histograms. This process is done automatically by a program and helps to understand the earthquake impact quickly. In attempting to evaluate the uncertainty of the assigned intensity and the influence of each question we used two methods: (1) a random selection of 10 reference histograms to calculate the intensity and (2) random perturbations on the values of the reference histograms (between $\pm 20\%$ of the original value). The results of (1) showed that the intensity calculated by the program was the same in the majority of cases. The highest difference observed was of one unit on the MMI scale. Also after thousands of combinations using different values to the reference histograms, the final intensity was the same as using the original probabilities. These results lead us to conclude that even if the user chooses an answer that can super estimate or underestimate the intensity, the use of this wrong answer alone is attenuated by the correct ones. We can also state that a possible variation of $\pm 20\%$ on the reference values assigned by the interpreter, while creating the reference histogram, don't deviate the current estimate.

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