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Uncertainties related to seismic hazard assessment

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Seismic hazard analysis in the last few decades has become a very important issue. Recently, new technologies and available data have been improved that have helped many scientists to understand where and why earthquakes happen, the physics of earthquakes, etc. Scientists have begun to understand the role of uncertainty in seismic hazard analysis. However, how to handle existing uncertainty is still a significant problem. The same lack of information causes difficulties in quantifying uncertainty accurately.
Usually attenuation curves are obtained in a statistical manner: regression analysis. Statistical and probabilistic analysis show overlapping results for the site coefficients. This overlapping takes place not only at the border between two neighboring classes, but also among more than three classes. Although the analysis starts from classifying sites using geological terms, these site coefficients are not classified at all. In the present study, this problem is solved using fuzzy set theory. Using membership functions, the ambiguities at the border between neighboring classes can be avoided. Fuzzy set theory is performed for southern California in the conventional way. In this study, standard deviations that show variations between each site class obtained by fuzzy set theory and the classical manner are compared. Results of this analysis show that when we have insufficient data for hazard assessment, site classification based on fuzzy set theory shows values of standard deviations less than those obtained use the classical way, which is direct proof of less uncertainty.