Lessons Learned for Ground Motion Prediction Equation Development from NGA West

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ABSTRACT:

Recent earthquake ground motion prediction relations, such as those developed from the Next Generation Attenuation (NGA) West project in 2008, have established a new baseline for the estimation of ground motion parameters such as peak ground acceleration (*PGA*), peak ground velocity (*PGV*), and spectral acceleration (*Sa*) for active tectonic shallow crustal regions. Current efforts are underway to develop a similar set of equations for NGA East that would pertain to the Central and Eastern parts of North America. We perform statistical goodness-of-fit analyses to quantitatively compare the predictive abilities of the recent models NGA West models. The prediction accuracy of the models is compared using several testing subsets of the master database used to develop the NGA models. Using these subsets, we compare the predictive capabilities of the models for soil and rock sites for both mainshocks and aftershocks. Somewhat surprisingly, the simpler NGA models perform better than the models of greater complexity when tested on the most comprehensive subsets. By comparing the predictor variables and performance of different models, we discuss the sources of uncertainty in the estimates of ground motion parameters and offer recommendations for model development. The decisions that model developers make during the selection of their regression datasets, such as the inclusion of aftershocks and determination of distance cutoffs, can greatly affect the models' predictive capabilities. As the results of this study suggest, increased model complexity does not necessarily lead to increased prediction accuracy. This paper attempts to present a model validation framework to assess prediction accuracy of ground motion prediction relations and aid in their future development.