EGU21-11143
https://doi.org/10.5194/egusphere-egu21-11143
EGU General Assembly 2021

Ranking and calibration of ground-motion models using the stochastic area metric.

Jaleena Sunny[1], Marco De Angelis[2], and Ben Edwards[1]
[1]University of Liverpool, School of Environmental Sciences, United Kingdom of Great Britain – England, Scotland, Wales
[2]University of Liverpool, Institute of Risk and Uncertainty, United Kingdom of Great Britain – England, Scotland, Wales

The selection and ranking of Ground Motion Models (GMMs) for scenario earthquakes is a crucial element in seismic hazard analysis. Typically model testing and ranking do not appropriately account for uncertainties, thus leading to improper ranking. We introduce the stochastic area metric (AM) as a scoring metric for GMMs, which not only informs the analyst of the degree to which observed or test data fit the model but also considers the uncertainties without the assumption of how data are distributed. The AM can be used as a scoring metric or cost function, whose minimum value identifies the model that best fits a given dataset. We apply this metric along with existing testing methods to recent and commonly used European ground motion prediction equations: Bindi et al. (2014, B014), Akkar et al. (2014, A014) and Cauzzi et al. (2015, C015). The GMMs are ranked and their performance analysed against the European Engineering Strong Motion (ESM) dataset. We focus on the ranking of models for ranges of magnitude and distance with sparse data, which pose a specific problem with other statistical testing methods. The performance of models over different ranges of magnitude and distance were analysed using AM, revealing the importance of considering different models for specific applications (e.g., tectonic, induced). We find the A014 model displays good performance with complete dataset while B014 appears to be best for small magnitudes and distances. In addition, we calibrated GMMs derived from a compendium of data and generated a suite of models for the given region through an optimisation technique utilising the concept of AM and ground motion variability. This novel framework for ranking and calibration guides the informed selection of models and helps develop regionally adjusted and application-specific GMMs for better prediction.