Retrospectively checking the epistemic uncertainty required in logic trees for ground-motion prediction

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In the past few years there has been a growing recognition that the epistemic uncertainty in ground-motion prediction may not be adequately captured simply by selecting a set of previously published ground-motion models. This is true no matter how rigorous the selection process, which may include comparisons of predictions to observations from the region of interest using sophisticated statistical techniques. The central issue is making sure that the level of ignorance is captured but this is directly related to the lack of data rather than its presence. Therefore, we are trying to assess what we do not know as much as what we do.

In this study ground motion prediction equations (GMPEs) for western North America published up to 1981 (e.g. Trifunac, 1976; Joyner and Boore, 1981; Campbell, 1981) as well as backbone models based on these GMPEs are used to construct logic trees for ground-motion prediction for a hypothetical site in this region. These logic trees are then compared to the data that was recorded in this region after these models were published. This comparison will provide insight into the level of knowledge and ignorance in ground motions in western North America in the 1980s and what, given perfect foresight, would have been a defensible ground-motion logic tree for a seismic hazard assessment in this area at that time. Based on the findings of this analysis, conclusions will be drawn as to the level of epistemic uncertainty that needs to be captured in today's hazard studies.