



Probabilistic seismic hazard levels in France: influence of the source model choices

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Building the source model is the first step in a probabilistic seismic hazard study. The source model is intended to describe the frequencies of occurrences of future earthquakes in the area. In regions of low to moderate seismicity, the source model most often relies on an earthquake catalogue associated to a definition of seismogenic sources in space. In France, two earthquake catalogues are currently published and made public: the catalogue from the 2013 European Seismic Hazard model project (EHS13, Woessner et al. 2015) and the FCAT catalogue (Manchuel et al. 2017). Besides, two propositions for delineation of seismogenic sources are available: again the one used in ESHM13, partly based on the Autran et al. (1998) model for inner France, and the Baize et al. (2013) model.

The aim of the present study is to explore the variability of hazard levels depending on the source model uncertainty. Combining the available catalogue and seismogenic source definitions, alternative source models are built. Additionally, uncertainties related to the different steps involved in the modeling of earthquake recurrence are quantified as precisely as possible: uncertainties in the declustering, in the estimation of completeness time periods and in the estimation of Gutenberg-Richter parameters. One major difficulty to address is the quantification of uncertainties in regions of low seismicity where data is scarce. To determine probabilistic seismic hazard, a set of recent ground-motion prediction equations potentially adapted for the different French tectonic contexts and consistent with the ongoing update of the 2020 European hazard map (ESHM20) is considered.

Our results at the country level as well as for selected French cities enable to better understand (1) how much the choices made to build the source model can impact hazard levels, and (2) what is the overall variability on hazard levels for different return periods considering the current state-of-the art knowledge in France.