

How well constrained are earthquake rates in low-seismicity areas?

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Long-term earthquake-catalogue based rates are a necessary and applied ingredient for PSHA in most parts of the world. Even when geological data is available, catalogue-based data is used to supplement this to provide an assessment about the average frequency of events. These types of estimates rely on multiple assumptions including, at least, the following: 1) earthquake occurrence is constant and stationary in time; 2) the time-length of the catalogue used is the best representation of the time-period of interest; 3) the rates are Poissonian; and 4) the earthquakes used to estimate the rates are completely recorded. We show that the uncertainties in long-term rate assessment can be significantly higher than typically considered and are an important contributor to epistemic uncertainty in PSHA calculations. Particularly, special care needs to be taken when using long-term rates in low seismicity areas. In this study we look at the variability in earthquake rate as the sample size decreases and investigate how this uncertainty impacts PSHA calculations.

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