The New Zealand National Seismic Model: Rethinking PSHA

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ABSTRACT: Applied seismic hazard modelling in New Zealand has been largely based on the method of probabilistic seismic hazard analysis (PSHA) since the beginning of the 1980s. Early models used large regional uniform hazard zones based on recorded seismicity and tectonic information. This approach was significantly modified by Stirling et. al. (1998, 2002) with the use of active faults, a gridded smoothed seismicity model based on the earthquake catalogue, and a single ground motion prediction equation (GMPE; McVerry, et. al., 2006). This model was revised by Stirling, et. al. (2012) and now contains more than 500 faults (with some use of time-dependence) and an updated seismicity model.

In recent work we have developed a time-dependent hazard model for Canterbury. We have used a hybrid model that captured time-dependence on three different time scales, from short-term to long-term. Additionally, a logic tree was used to combine the McVerry et al (2006) GMPE with the more recently developed Bradley (2010) GMPE to quantify differences between these two models.

Our current work in seismic hazard is focused on rethinking some of the fundamentals of PSHA. This includes such things as what defines a source model, what information should be included, how to best capture epistemic uncertainty in ground motion modelling, updating the subduction zone model, and how we can verify if a new model is indeed an improved model. Finally we are investigating how modelling of synthetic seismicity and ground motions based on physics can be used in future seismic hazard in New Zealand.