Rethinking PSHA

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ABSTRACT

Since the early 1980s seismic hazard assessment in New Zealand has been based on Probabilistic Seismic Hazard Analysis (PSHA). The most recent version of the New Zealand National Seismic Hazard Model, a PSHA model, was published by Stirling et al, in 2012. This model follows standard PSHA principals and combines a nation-wide model of active faults with a gridded point-source model based on the earthquake catalogue since 1840. These models are coupled with the ground-motion prediction equation of McVerry et al (2006). Additionally, we have developed a time-dependent clustering-based PSHA model for the Canterbury region (Gerstenberger et al, 2014) in response to the Canterbury earthquake sequence.

We are now in the process of revising that national model. In this process we are investigating several of the fundamental assumptions in traditional PSHA and in how we modelled hazard in the past. For this project, we have three main focuses: 1) how do we design an optimal combination of multiple sources of information to produce the best forecast of earthquake rates in the next 50 years: can we improve upon a simple hybrid of fault sources and background sources, and can we better handle the uncertainties in the data and models (e.g., fault segmentation, frequency-magnitude distributions, time-dependence & clustering, low strain-rate areas, and subduction zone modelling)? 2) developing revised and new ground-motion predictions models including better capturing of epistemic uncertainty – a key focus in this work is developing a new strong ground motion catalogue for model development; and 3) how can we best quantify if changes we have made in our modelling are truly improvements? Throughout this process we are working toward incorporating numerical modelling results from physics based synthetic seismicity and ground-motion models.

KEYWORDS: *PSHA, time-dependence, uncertainty, New Zealand, ground-motion prediction*