

Recent Advances in the Modelling of Earthquake Hazard in Australia: Part 1 - Source, Attenuation and Site Response Models.

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This paper is the first in a series of two companion papers describing the techniques currently being used to estimate earthquake hazard in Australia. This paper focuses on advances in creating the models that form the basis of any earthquake hazard assessment, specifically:

- *a source model* that defines the probability of an earthquake of a given magnitude occurring in a year;
- *an attenuation model* that describes how earthquake ground shaking or intensity decreases with distance away from an earthquake source, and;
- *a site response model* that describes how local regolith affects the ground shaking experienced during an earthquake.

The models are described with examples from a recent earthquake hazard assessment of Newcastle and Lake Macquarie, NSW.

Previously in Australia, source models have been developed largely on the basis of historical seismicity. However, in Newcastle and Lake Macquarie expertise from structural geologists has been incorporated into the development of source models. Consequently, the resultant source model highlights regions of seismicity associated with local geological structures and structural provinces.

The attenuation of earthquake energy is poorly defined in Australia, and hence the hazard assessment of Newcastle and Lake Macquarie has adopted a model for central and eastern North America. The adopted model is from a similar tectonic environment to Australia and is able to account for the variability that is inherent in natural processes.

Detailed geotechnical data has been used to create geotechnical models of the regolith in Newcastle and Lake Macquarie. These geotechnical models were used in an equivalent-linear analysis of the regolith's response to earthquake ground shaking. Unlike previous attempts to model site response, this model also includes the variability in site response due to natural variations in the regolith.

Part 2 of this series describes how these models are amalgamated and used to estimate earthquake hazard in Newcastle and Lake Macquarie.