STRONG GROUND MOTION SIMULATION OF AUSTRALIAN INTRAPLATE EARTHQUAKES AND THEIR RELATIONSHIP WITH THE RECOMMENDED RESPONSE SPECTRA

Cvetan SINADINOVSKI[1], Kevin F MCCUE[2] And Malcolm SOMERVILLE[3]

SUMMARY

Globally the majority of earthquakes are interplate, although moderate to large earthquakes occur intraplate, i.e. within the plates. The seismicity of the Australian continent is typical of that experienced in intraplate environments. Seismic records of Australian intraplate earthquakes are investigated by their characteristics such as the frequency content, the peak acceleration and the duration.

Due to lack of quality strong motion records of intraplate earthquakes at short distances, synthetic seismograms are commonly used for testing structural behaviour. In this case, the near field synthetic records of likely intraplate earthquakes will be analysed, with a strong ground motion duration of several seconds. A Green's Function method is chosen to simulate a large earthquake by summation in time of a number of smaller earthquakes or sub-events, each given a slightly different origin time to represent the propagation of a rupture along a fault plane.

In the first instance, the magnitude 2.3 aftershock of the 29 December 1989 Newcastle earthquake recorded on a few sites was used as sub-event to simulate the main shock of magnitude 5.6. Validation studies for events recorded elsewhere in Australia are also considered. The response spectra of the suite of synthetic events will be later compared with the recommended spectra developed empirically from a statistical analysis of strong motion data for magnitude ~6 intraplate earthquakes recorded elsewhere and normalised for a typical 500 year RP peak ground velocity. Their relationship will determine whether the synthetic waveforms produced by this method are realistic and can be used to reliably represent ground motion during Australian intraplate earthquakes

Strong motion records of Australian intraplate earthquakes show different characteristics such as frequency content, peak acceleration and duration, when compared with events from inter-plate regions. The lack of quality strong motion records of intraplate earthquakes at short distances demands the use of synthetic seismograms for testing of structural behaviour. In this study, the near-field synthetic records of likely intraptate earthquakes are considered, with a strong ground motion duration of several seconds.

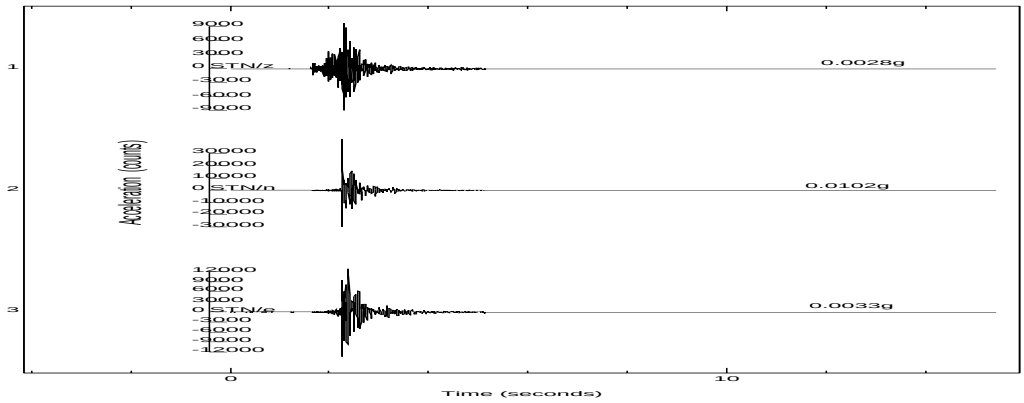
The basic assumption of Green's Function method is that a large earthquake can be simulated by the summation in time of a number of smaller earthquakes. Earthquake sub-events are given slightly different origin times to represent the propagation of a rupture along a fault plane. The magnitude 2.3 aftershock of the 29 December 1989 Newcastle earthquake recorded on rock site was used as sub-event in this case.

[1] *AGSO Seismological Centre - Canberra, Australia*
[2] *AGSO Seismological Centre - Canberra, Australia*
[3] *AGSO Seismological Centre - Canberra, Australia*

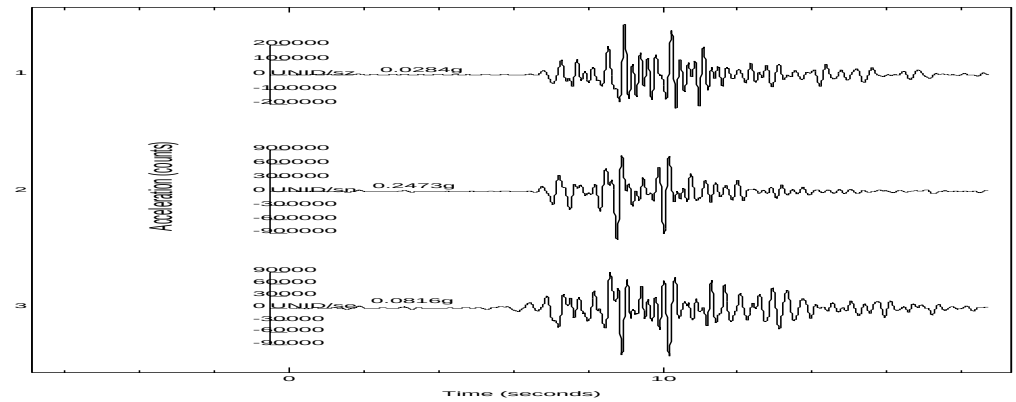
ABSTRACT

Strong motion records of Australian intraplate earthquakes show different characteristics such as frequency content, peak acceleration and duration, when compared with events from inter-plate regions. The lack of quality strong motion records of intraplate earthquakes at short distances demands the use of synthetic seismograms for testing of structural behaviour. In this study, the near-field synthetic records of likely intraptate earthquakes are considered, with a strong ground motion duration of several seconds.

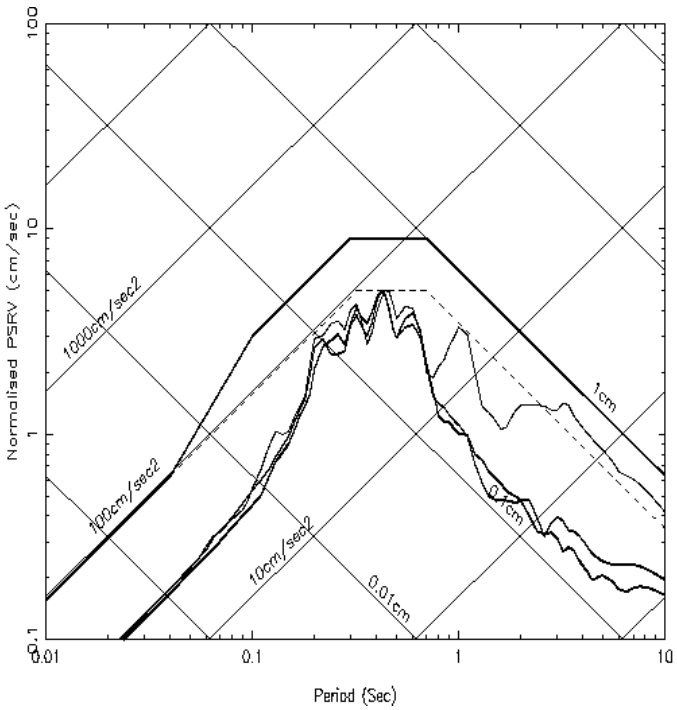
The basic assumption of Green's Function method is that a large earthquake can be simulated by the summation in time of a number of smaller earthquakes. Earthquake sub-events are given slightly different origin times to represent the propagation of a rupture along a fault plane. The magnitude 2.3 aftershock of the 29 December 1989 Newcastle earthquake recorded on rock site was used as sub-event in this case.



Using the aftershock we simulated a main shock of magnitude 5.6.



Validation studies for subsequent events recorded elsewhere in Australia are reported. Thirteen strong motion records and response spectra recorded on rock at close range were selected for thrust type earthquakes with magnitude ~6 away from plate boundaries. The records were normalised to a pgv of 5cm/s and we computed the 5% damped elastic spectra. These lent themselves to modelling using a trapezoidal scheme, as illustrated below.



The results of the study show that the synthetic near-field seimograms produced by this method are realistic and can be used to represent ground motion during typical Australian intraptate earthquakes.

.