

**THE NEW NATIONAL SEISMIC HAZARD MODEL FOR NEW ZEALAND, AND THE M_w 7.1, 4
SEPTEMBER 2010 DARFIELD EARTHQUAKE**

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A team of earthquake geologists, seismologists and engineering seismologists from GNS Science, NIWA, University of Canterbury, and Victoria University of Wellington have collectively produced an update of the 2002 national probabilistic seismic hazard (PSH) model for New Zealand. The new model incorporates over 200 new onshore and offshore fault sources, and utilises newly developed New Zealand-based scaling relationships and methods for the parameterisation of the fault and subduction interface sources. The background seismicity model has also been updated to include new seismicity data, a new seismicity regionalisation, and improved methodology for calculation of the seismicity parameters. Background seismicity models allow for the occurrence of earthquakes away from the known fault sources, and are typically modelled as a grid of earthquake sources with rate parameters assigned from the historical seismicity catalogue.

The Greendale Fault, which ruptured during the M_w 7.1, 4 September 2010 Darfield earthquake, was unknown prior to the earthquake. However, the earthquake was to some extent accounted for in the PSH model. The maximum magnitude assumed in the background seismicity model for the area of the earthquake is 7.2 (larger than the Darfield event), but the location and geometry of the fault are not represented. Deaggregations of the PSH model for Christchurch at return periods of 500 years and above show that $M7$ - 7.5 fault and background source-derived earthquakes at distances less than 40 km are important contributors to the hazard. Therefore, earthquakes similar to the Darfield event feature prominently in the PSH model, even though the Greendale Fault was not an explicit model input.