

Earthquake and tsunami losses for the Wellington region

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Following the Boxing Day tsunami of 2004, the Institute of Geological and Nuclear Sciences (GNS) released the Report “Review of Tsunami Hazard and Risk in New Zealand”. The findings of this report surprised many. For a 500 year return period event deaths ranged from 2,900 to 10,000 people. Forecasts of property damage ranged from NZD12bn to NZD21bn. These values were multiples of most estimates of earthquake shaking damage. Recognising the importance of this report; Benfield commissioned GNS to advance this research using state of the art modelling techniques. The aim was to more accurately model the tsunami loss forecasts in the Wellington region.

In 1855 a massive earthquake, of magnitude 8.2, ruptured the Wairarapa fault on the North Island of New Zealand. The fault extended into Cook Strait where it caused a tsunami with run ups of up to 10 metres at locations on the coast. Parts of the Miramar peninsula, at the time largely unoccupied but now a suburb of Wellington, were inundated by the wave.

The Wairarapa Fault is one of several faults that can potentially affect the Cook Strait region and the city of Wellington in particular. Other potential sources include the Hikurangi subduction zone, the Wellington Fault, and other crustal faults within Cook Strait such as the BooBoo Fault.

We have used ANUGA to model the potential tsunami from earthquakes on these faults using the best available fault models. ANUGA allows the propagation and inundation of the tsunami to be modelled within a single unstructured mesh, one useful feature being the ability to easily incorporate the effect of co-seismic uplift on the inundated terrain. The Wairarapa fault model is particularly useful as a reference case as much is known about the 1855 earthquake and subsequent tsunami and this can be used to prepare a detailed source model, and to make comparisons of the simulation outputs with real observations.

We will describe our use of ANUGA to perform this modelling to the workshop, and present the results of our simulations, along with a discussion of the implications for earthquake and tsunami risk in the Cook Strait region.