Source Models of Tsunamigenic Earthquakes on the Hikurangi Plate Interface

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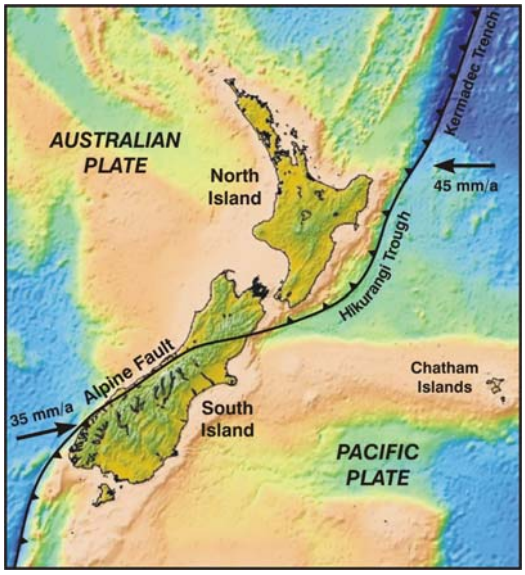
Abstract

New Zealand straddles the boundary between the Pacific and Australian plates and has subduction taking place beneath the North Island and the lower South Island, yet the tsunamigenic potential of these subduction zones is relatively unstudied. The last great earthquakes on these plate interfaces occurred before they could be recorded in written history, so we are largely dependent on paleo-studies and modelling to estimate their future impact.



Analysis of recent GPS measurements suggests that the plate interface is currently locked beneath the southern North Island, and consequently a "slip deficit" is accumulating. We aim to use GPS-derived estimates of the distribution of interseismic slip deficits on the Hikurangi plate interface to estimate the slip distribution of subsequent plate-interface ruptures. The slip distribution will then be used to determine the seabed deformation east of North Island.

We present a preliminary model of tsunami-propagation based on these estimates of co-seismic deformation, and use these to estimate near-shore wave heights around the New Zealand coastline. Many uncertainties remain in the parameterization of these models, for which a better geological and geophysical understanding of the plate interface is needed. Key among these uncertainties are the segmentation of future earthquakes, the rupture behaviour close to the trench, and the return time between ruptures.

We aim to constrain these uncertainties as far as possible using available knowledge, and to produce an ensemble of different models to cover the range of conceivable scenarios.