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# Investigation of the effects of earthquake rupture complexity on tsunami inundation hazard in Wellington Harbour

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Recent investigations of the effects of earthquake rupture complexity have shown that not only the distribution of near shore tsunami amplitudes but also the extent of inundation is strongly dependent on the specific instance of earthquake slip distribution.

We have investigated the effects of different potential examples of slip distributions on the tsunami inundation hazard posed by three earthquake sources for the shore areas of the Wellington Harbour and Wellington's south coast (New Zealand): the Hikurangi subduction interface (Mw = 9.0), the Wairarapa Fault (Mw = 8.1) with a potential contribution of the Wharekauhau Thrust, and the Wellington Fault (Mw = 7.4).

We find that the crustal fault sources (Wellington Fault and Wairarapa Fault) pose less of an inundation hazard than the studied events on the Hikurangi subduction interface. The Wairarapa Fault scenarios suggest that an earthquake on this fault will mainly affect the Wellington south coast. A simultaneous rupture of Wharekauhau Thrust would further enhance the generation of tsunami waves. Geodetic studies suggest that slip released in a large Hikurangi earthquake is potentially concentrated at the southern part of the interface and this was found to lead to increased inundation in the Hikurangi scenarios. Non-uniform slip distributions that happen to concentrate slip in the Cook Straight region have much the same effect.

This study is the first we know of that attempts to understand the effects of rupture complexity on tsunami generation by earthquakes on upper plate faults, in this case the Wairarapa and Wellington Faults. The results of this study help to understand the role of earthquake complexity on tsunami generation by these faults.