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A Local and Regional Tsunami Early Warning System for New Zealand: A feasibility study

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Local tsunami mitigation in New Zealand is based on self evacuation following long-duration or intense ground motions. Slow-rupturing 'tsunami earthquakes', as have occurred historically on the Hikurangi margin (1880 and twice in 1947), might not be felt strongly enough to trigger self evacuation. Slip kinematics and distribution influence tsunami propagation and inundation patterns significantly. To establish an effective early warning system for such events, rapid inversion is needed to resolve these earthquake source parameters.

We will give an update on recent results from on-going efforts at GNS Science in collaboration with international partners to assess the feasibility of implementing a local tsunami early warning system targeting 'Tsunami Earthquakes' in New Zealand. We performed simulations of kinematic and static surface displacements for a scenario event similar to the March 1947 tsunami earthquake. The created data sets are used to assess the detection capabilities of and potential required updates to the New Zealand seismic and geodetic sensor network (GeoNet). A suite of detection, classification and inversion algorithms has been tested with the simulated data.

Our findings indicate that an event similar to the 1947 Gisborne Tsunami Earthquake could be classified as potentially tsunamigenic from seismic data alone. It also should be detectable and classifiable by the geodetic network in real time. However, a combination of kinematic and static deformation (seismic and geodetic) data is required to drive a full rapid detection, classification and inversion algorithm chain. For an operational early warning system to be implemented a large portion of the geodetic sensor network needs to be upgraded to stream data in real time to GeoNet.