

Assessing and Communicating Risk from Low-Activity Faults in British Columbia, Canada

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The 2010-2011 Canterbury Earthquake sequence cost approximately 20% of New Zealand's Gross Domestic Product and caused 185 deaths in the nearby city of Christchurch. Over 7000 people were injured, entire neighborhoods had to be demolished, and 9 years later the city continues its rebuild. Though the faults responsible for these events were not previously identified as being seismogenic, they were indeed capable of wreaking havoc.

Identifying all active fault structures and constraining well their activity rates is an impossible task. As such, seismic hazard maps have been based primarily on a probabilistic assessment of likely shaking rather than a deterministic consideration of active fault sources. Where fault sources are well constrained, they can augment a region's seismic hazard assessment. This is the case for the 2015 Canadian National Seismic Hazard Map, which considers distinct sources for Cascadia, Haida Gwaii, and the Yukon, albeit in a probabilistic way. This means that the discovery of new potentially active crustal faults presents a significant challenge for implementation into hazard assessments. They often deform slowly, if at all, making it difficult to determine whether the fault will rupture again. Without reliable constraints on the magnitude-recurrence relationship for that fault, it cannot be considered meaningfully in a probabilistic-based national hazard model. These low-activity faults, and the risk they pose, however, cannot be ignored: the recently studied Devil's Mountain-Leech River Fault runs through downtown Victoria, BC, with a maximum magnitude greater than M7.

Using deterministic scenario models presents one way of alleviating this problem. New data about faults or paleoseismicity can be developed readily into scenario earthquakes which are consistent with disaggregation of probabilistic seismic hazard assessments for a given location. Performing hazard and risk assessment of these scenarios allows one to estimate the impact of the faults on nearby settlements. Emergency managers, community leaders, and city planners all rely on disaster scenarios to prepare for and mitigate the impacts of future crises. Perhaps more importantly, however, scenario earthquakes create a story to which the average person



Scenario earthquakes currently considered in this study.

can connect – making the scenarios a potent tool for communication. We will report on current work at Natural Resources Canada to create a catalogue of earthquake scenarios, based on disaggregation of the National Seismic Hazard Map and identification of seismic sources in Southwestern BC, including low-activity crustal faults. We discuss strategies for using the resulting risk models to effectively communicate earthquake hazards.