

Effects and uncertainty from various declustering methods and consequences for seismic hazard and seismic risk in New Zealand

E. Apel & M. Nyst

RMS, inc, Newark, CA



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ABSTRACT: We apply different declustering methods to the New Zealand earthquake catalog to estimate regional seismicity rate changes and the consequent impact on earthquake hazard and risk in the area. We explore the sensitivity of the declustering parameters (e.g. Reseanberg, 1985) as well as the variable magnitude and time windows (e.g. Gardner and Knopoff, 1974) on the magnitude-frequency relationships derived from declustered catalogs for the background zones in New Zealand. We incorporate background rate estimates from the full catalog and compare them with the range of background rates from all of the declustering methods to our risk model. We then compare a suite of metrics between the full catalog rates and the models with declustered rates to assess 1) the impact on hazard and risk from using one declustering method versus another and 2) the epistemic uncertainty associated with the range of catalog declustering techniques. In areas where the seismic hazard is dominated by larger crustal faults (e.g. Wellington) the choice of declustering method makes less of an impact on the hazard or risk. However, in areas like Auckland where the background zone contribution to the seismic hazard is greater, the choice of declustering technique is more significant (Christophersen et al., 2011).