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Quantifying the Variability in Damage of Structures as a Result of Geohazards

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Uncertainty is ever present in catastrophe modelling and has recently become a popular topic of discussion in insurance media. Each element of a catastrophe model has associated uncertainties whether they be aleatory, epistemic or other. One method of quantifying the uncertainty specific to each peril is to estimate the variation in damage for a given intensity of peril. For example, the proportion of total cost to repair a structure resulting from an earthquake in the regions of the affected area with peak ground acceleration of 0.65g may range from 10% to 100%. This variation in damage for a given intensity needs to be quantified by catastrophe models. Using insurance claims data, we investigate how damage varies for a given peril (e.g. earthquake, tropical cyclone, inland flood) as a function of peril intensity. Probability distributions (including those with a fat tail, i.e. with large probability of high damage) are fitted to the claims data to test a number of perils specific hypotheses, for example that a very large earthquake will cause less variation in losses than a mid-sized earthquake. We also compare the relationship between damage variability and peril intensity for a number of different geohazards. For example, we compare the uncertainty bands for large earthquakes with large hurricanes in an attempt to assess whether loss estimates are more uncertain for hurricanes say, compared to earthquakes. The results of this study represent advances in the appreciation of uncertainty in catastrophe models and of how losses to a notional portfolio and notional event could vary according to the empirical probability distributions found.