



Applications of modelling historical catastrophic events with implications for catastrophe risk management

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The management of catastrophe risk is concerned with the quantification of financial losses, and their associated probabilities, for potential future catastrophes that might impact a region. Modelling of historical catastrophe events and, in particular, the potential consequences if a similar event were to occur at the present day can provide insight to help bridge the gap between what we know can happen from historical experience and what potential losses might be out there in the “universe” of potential catastrophes.

The 1908 Messina Earthquake (and accompanying local tsunami) was one of the most destructive earthquakes to have occurred in Europe and by most accounts remains Europe’s most fatal with over 70,000 casualties estimated. However, what would the potential consequences be, in terms of financial and human losses, if a similar earthquake were to occur at the present day? Exposures, building stock and populations can change over time and, therefore, the consequences of a similar earthquake at the present day may sensibly differ from those observed in 1908. The city of Messina has been reconstructed several times in its history, including following the 1908 earthquake and again following the Second World War. The 1908 earthquake prompted the introduction of the first seismic design regulations in Italy and since 1909 parts of the Messina and Calabria regions have been in the zones of highest seismic coefficient.

Utilizing commercial catastrophe loss modelling technology – which combines the modelling of hazard, vulnerability, and financial losses on a database of property exposures – a modelled earthquake scenario of M7.2 in the Messina Straits region of Southern Italy is considered. This modelled earthquake is used to assess the potential consequences in terms of financial losses that an earthquake similar to the 1908 earthquake might have if it were to occur at the present day. Loss results are discussed in the context of applications for the financial and insurance industries. Separately an estimate of the human casualties that such a scenario might produce has been derived, considering the effects of both building collapse and tsunami. Casualty estimates due to building collapse are derived based on intensity output from the loss model combined with probabilities of collapse for different intensities, assuming the same time of occurrence as the 1908 earthquake (5:20 am). At the present day, we estimate that such a scenario would result in around 17,000 fatalities from building collapse and up to 2,000 fatalities from the tsunami.