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Earthquake Catastrophe Modelling for Switzerland

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Although earthquake hazard in Switzerland is relatively low in comparison with other European regions such as Southern Europe and the Mediterranean, the country has experienced damaging earthquakes throughout its history, most notably in 1356 (Basel) and 1855 (Visp).

As part of the recently renewed efforts by the Swiss national and local governments and various research organisations to reassess the seismic risk in the country, the authors have been involved in the development of a probabilistic earthquake loss-estimation model for Switzerland. The model is based on estimates of ground motion and building vulnerability, as well as an industry-wide building inventory database that categorises structures by predominant building material and building height. The model is currently used by the insurance and reinsurance industry to facilitate the management and transfer of catastrophe risk in Switzerland.

This paper presents technical details of the ground motion hazard and building vulnerability. Ground motions are calculated based on Bay et al. (2003) and Ambraseys et al. (1996) attenuation relations, which are then adjusted through the NEHRP (National Earthquake Hazard Reduction Program) soil-amplification procedure according to surface geology. Building vulnerability is measured as a function of Roof Drift Ratio (RDR), which is estimated through the Capacity Spectrum Method (CSM). For key construction types, the capacity curves are developed based on experimental and/or analytical studies of buildings specific to the Swiss practice.

The model is also used to estimate loss distributions of key selected historical events such as the 1356 Basel and the 1855 Visp earthquakes, if these events were to recur today. The loss distributions reflect the uncertainty in the source parameters of these events as estimated from pre-instrumental era.