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Rapid assessment of the likelihood of earthquake-induced hazards in Switzerland

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As dramatically demonstrated by abundant observations worldwide - including the recent earthquake sequence in Nepal in 2015 - landslides are a major earthquake-induced threat in mountain regions. Approximately 5% of all earthquake-related fatalities worldwide are caused by landslides triggered by earthquake shaking. In Switzerland, nearly all historical Mw $\sim>$ 6 earthquakes are associated to damaging mass movements, resulting in some cases into destruction of settlements and loss of lives. Soil liquefaction is a critical secondary effect in the perspective of rapid response, loss estimation, and emergency planning due to its often large impact on lifeline systems, industrial and residential settlements. Recent moderate events associated with extensive liquefaction observations occurred in Christchurch, New Zealand, in 2010 and Mirandola, Italy, in 2012. These earthquakes have the typical size of damaging Swiss alpine events. In Switzerland, liquefaction is known to have historically occurred e.g. after the 1855 Mw 6.2 earthquake of Visp, where the valley floor is presently highly built and industrialised. With this motivation, we describe in this contribution the customisation to Swiss conditions of global empirical approaches to the rapid estimation of earthquake-induced landslide and liquefaction likelihoods. The probability of occurrence of these secondary hazards is parameterised through a set of georeferenced susceptibility proxies (e.g. geomorphology, surface geology, ground types, soil wetness) and intensity measures. The coefficients of the predictive models are calibrated against the shaking constraints from past events and optimised for near-real-time estimates based on USGS-style ShakeMaps as used at the Swiss Seismological Service (SED). Emphasis is on the use of high-resolution topographic datasets along with the refinement of the likelihood estimates based on geological and geotechnical information available in the Swiss context.