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Seismologically-consistent prediction of earthquake induced landsliding: Towards near-real time prediction of total landslide volume, total landslide area and regional area affected by earthquake-induced landsliding.

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Earthquakes are an important trigger of landslides and can contribute significantly to sedimentary and organic matter fluxes.
We present a new seismologically-consistent expression for the prediction of total area and volume of populations of earthquake-induced landslides (Marc et al., 2016) as well as for their regional area of occurrence (Marc et al., 2017). This model implements essential seismic processes, linking key parameters such as ground acceleration, fault size, earthquake source depth and seismic moment. To assess the model we have compiled and normalized estimates of total landslide volume, total landslide area and regional area affected by landslides for 40, 17 and 83 earthquakes, respectively.
We have found that low landscape steepness systematically leads to overprediction of the total area and volume of landslides. When this effect is accounted for, the model is able to predict within a factor of 2 the landslide areas and associated volumes for about 70% of the cases in our databases. The prediction of regional area affected do not require a calibration for the landscape steepness and gives a prediction within a factor of 2 for 60% of the database. For 7 out of 10 comprehensive inventories we show that our prediction compares well with the smallest region around the fault containing 95% of the total landslide area. This is a significant improvement on a previously published empirical expression based only on earthquake moment.
We discuss some additional parameters that seem required in the model to explain some outliers, such as exceptional rock mass strength in the epicentral area, shaking duration and other seismic source complexities ignored by the model. However, most cases in our catalogue seem to be relatively unaffected by these effects despite the variety of lithologies and tectonic settings they cover. This makes the model suitable for integration into landscape evolution models, and application to the assessment of secondary hazards and risks associated with earthquake scenari. It could also be used to estimate earthquake-induced landsliding magnitude and region of occurrence in near-real time, based on available earthquake parameters detection routine.