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Empirical Relationship for Probability of Earthquake induced Landslide Failure

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The estimation of probability of landslide failure at each grid point under an expected earthquake ground shaking is fundamental in seismic landslide study. We attempt to build an empirical relationship among probability of failure, basic susceptibility, and Arias intensity using Taiwan data set.
At the first step, we use the Chi-Chi earthquake-induced landslide inventory as a training data set to build a susceptibility model for the region. Because the model included Arias intensity of the earthquake, it is event-dependent; the landslide distribution is highly dependent to the earthquake intensity. However, if we extract the Arias intensity factor from the susceptibility model, then it becomes event-independent, and it is similar in pattern to the event-independent model trained by storm-induced landslides. Also, the event-independent models are similar in pattern to the susceptibility model trained by a multi-temporal landslide inventory. We found there is a basic susceptibility model for a region, no matter an event-based model or a model trained by a multi-temporal landslide inventory.
After the basic susceptibility of a region is determined, then we can analyse the probability of failure of a certain event at each basic susceptibility and Arias intensity bins and build their relationship. Again, the Chi-Chi earthquake-induced landslide inventory and the Chi-Chi Arias intensity map are used in the analyses together with a basic susceptibility model in central Taiwan. A new empirical relationship is developed to estimate probability of landslide failure as a function of basic susceptibility and Arias intensity based on the Chi-Chi data set. The results show that the relation is good; the probability of failure increases with an increase in Arias intensity and also increases with an increase in the basic susceptibility. This relationship could be a prediction model for earthquake-induced landslide, providing Arial intensity and basic susceptibility are given.