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Regression models for estimating Newmark co-seismic displacements in Spain

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Regional evaluation of seismic-induced landslide hazard is done through the evaluation of Newmark's co-seismic displacements and their comparison with several thresholds of displacement. These co-seismic displacements may be computed from double integration of accelerogram records or, more frequently, form empirical models stablished between computed displacements (from accelerograms) and characteristics of ground motion (i.e. PGA, Arias intensity). At present, different authors have proposed regression models from earthquakes occurred around the world, usually of moderate to high magnitude (Mw > 6.0). Because event magnitude controls duration and frequency content of accelerograms, the co-seismic displacements computed form accelerograms recorded during earthquakes of moderate to high magnitude cannot be used to study scenarios of moderate to low magnitude earthquakes. This type of seismic scenario is the most common in Spain, where during the last decades several moderate to low magnitude earthquakes (Mw < 5.5) have triggered multiple landslides.
In this work, we present regression models for estimating Newmark co-seismic displacements from accelerograms recorded during 28 events occurred in Spain, with magnitudes ranging between 3.6 and 6.3. Co-seismic displacements resulting from these new models are lower than those computed from previously published models, as expected. Observed differences highlight the importance of using empirical models valid for the range of magnitudes of interest for the scenarios to be studied.