INTRODUCTION

The assessment of earthquake-triggered landslide hazard at a regional scale always implies important simplifications. Uncertainties in accurately defining ground-motion characteristics or in particular sites, as well as in choosing the geological parameters of the materials involved, determine the large number of possible outcomes of this complex process. Therefore, it is necessary to perform exhaustive analyses using the best available information. These procedures followed in regional assessments deal with the earthquake field using similar methods to the ones used in the near-field. The estimation of Newmark displacements in regional hazard assessment is especially tricky due to the large number of variables involved, the lack of precise data, and the complexity of the geological, geotechnical, and structural characteristics of the materials involved. In this work, we compare a number of Newmark displacement regression equations in order to select one that could be used to study areas with moderate to low magnitude earthquakes. This type of seismic scenario is the most common in Spain, where during the last decades several incidents of low magnitude earthquakes (M < 5.0) have triggered multiple slope instabilities. In particular, the 2011 Lorca earthquake (M = 5.1) is the largest magnitude earthquake to have occurred in Spain in recent times. The aim of this study is to contribute to the seismic landslide hazard mapping in areas with moderate to low magnitude earthquakes.

CO-SEISMIC LANDSLIDES DURING 2011 LORCA EARTHQUAKE

Examples of co-seismic landslide hazards in the surroundings of Cejo de los Enamorados during the 2011 Lorca earthquake (Rodríguez-Peces, 2010).

STRENGTH PARAMETERS

<table>
<thead>
<tr>
<th>Rocks</th>
<th>Calcarenites</th>
<th>Conglomerates</th>
<th>Metapelitic rocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0.84</td>
<td>0.87</td>
<td>0.87</td>
</tr>
<tr>
<td>High</td>
<td>0.84</td>
<td>0.87</td>
<td>0.87</td>
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<tr>
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<tr>
<td>High</td>
<td>0.84</td>
<td>0.87</td>
<td>0.87</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Soils</th>
<th>Mark</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
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<td>39</td>
</tr>
<tr>
<td>High</td>
<td>0.02</td>
<td>87</td>
</tr>
</tbody>
</table>

Values obtained from direct shear tests assuming a Mohr-Coulomb failure criterion.

CONCLUSIONS

We compare a number of Newmark displacements regression equations in order to select one that could be used to study areas with moderate to low magnitude earthquakes. The regression equation which offers the optimum results on the earthquake-triggered landslides location is the one that estimate Newmark displacement as a function of Arias intensity and critical acceleration (Jibson, 2007). This regression equation could be used in similar areas with moderate to low magnitude earthquakes for regional hazard assessments.

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References


Testing regression models for estimating Newmark co-seismic displacements in moderate to low seismic areas

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