Geophysical Research Abstracts
Vol. 20, EGU2018-6105, 2018
EGU General Assembly 2018

Susceptibility analysis of co-seismic slope instabilities in the Murcia Region (SE Spain) considering site effect

Meaza Tsige (1), Martín Jesús Rodríguez-Peces (1), José Delgado (2), and Ignacio García Flórez (1)

(1) Department of Geodynamics, Stratigraphy and Paleontology. Faculty of Geological Sciences. University Complutense of Madrid, Spain (martinjr@ucm.es), (2) Department of Environment and Earth Sciences, University of Alicante, Spain (jose.delgado@ua.es).

The Murcia Region (SE Spain) is a seismically active zone with several active faults that can potentially generate earthquakes of magnitudes higher than Mw 6.0 (e.g. Alhama de Murcia fault). Considering the geology and topography of the region, there are several prone areas to slope instability processes. These areas comprise soft and poorly consolidated soils (Quaternary sand and gravels), highly fractured and alterable rock masses (limestone and clay marls) that, together with the possibility of an earthquake of sufficient magnitude, can trigger or reactivate slope movements close to some densely populated urban centers. An example of this is the Lorca earthquake of May 11, 2011, with a magnitude of Mw 5.2 and that was preceded by an event of magnitude Mw 4.6, which caused numerous damages in Lorca, as well as great social concern. This earthquake also produced slope instabilities of greater importance, up to a distance of more than 10 km from the epicenter, and which have been varied in their typology and size, reaching sometimes hundreds of cubic meters during the shaking. These facts justify the need to obtain maps that identify areas that are prone to slope instability.
In this work, we show the result of the regional analysis of susceptibility of hillside movements by earthquakes in the Murcia Region, using two different methodologies: the well-known Newmark displacement method and the Susceptibility Coefficient or ac/PGA ratio method. The susceptibility was estimated by comparing the critical acceleration (ac) with the peak ground acceleration (PGA) obtained from the seismic hazard map for a return period of 475 years in Murcia Region. In addition, the amplification factor was taken into account due to geological materials (site effect) and topography. The result shows large susceptible areas in which some type of slope instability could take place for the seismic scenario considered. These zones are related to rock (block) falls in outcrops of fractured rocks, with slopes between 20º-30º. There were identified also as susceptible areas with low slopes (<10º) and recent soft deposits of colluvio-alluvial type, where there is a possible high seismic amplification by lithology (site effect), being able to trigger shallow soil slides and lateral spreading. If we compare these results with the current inventories of co-seismic instabilities, a coincidence of more than 80 % is observed in the Susceptibility Coefficient map and 44 % in the Newmark displacement map. In this sense, the Susceptibility Coefficient method seems to be more suitable to predict areas with a certain level of susceptibility combined with a concrete lithology and topography conditions.