

Triggering of Planar and Wedge-Shaped Mass Movement during Earthquake – Based on Newmark Displacement Method and Velocity-Displacement Dependent Friction Law



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The large dip-slope failure, Tsaoiling landslide, occurred during the 1999 Taiwan Chi-Chi earthquake is one of the most studied landslides. Meanwhile, the catastrophic 2008 Wenchuan earthquake in Sichuan province of western China induced tens of thousands of landslides and the Daguangbao (DGB) landslide is the largest one with a volume of about one billion cubic meters. It is suggested that the DGB landslide is a wedge-shaped rock sliding along the intersection of bedding plane and a zigzag stepping-out joint system. The initiation and kinematics of these two earthquake-triggered large rock block with a planar and wedge shaped is evaluated using Newmark displacement method and velocity-displacement dependent friction law obtained from low- to high- velocity rotary shear tests. The earthquake induced down dip acceleration against the friction resistance on the sliding plane, the resulted velocity and the accumulated displacement of the block, and the evolution of the friction resistance with the slip velocity and displacement can be calculated. Accordingly, the interactive initiation process including a positive regulation from the velocity- displacement weakening mechanism can be depicted and finally resulted in the fast moving and long run-out rockslides.

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