# Revisit the classical Newmark displacement method for earthquake-induced wedge slide

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Newmark displacement method has been widely used to study the earthquake-induced landslides and adopted to explore the initiation and kinematics of catastrophic planar failure in recent years. However, surprisingly few researchers utilize the Newmark displacement method to study the earthquake-induced wedge slide. The classical Newmark displacement method for earthquake-induced wedge sliding assumed the wedge is rigid and the vertical acceleration, as well as the horizontal acceleration perpendicular to the sliding direction, is neglected. Moreover, the friction coefficients on the weak planes are assumed as unchanged during sliding. The purpose of this study is to test the reasonableness of the aforementioned assumptions. We design the geometry of the wedge and input the synthetic seismicity to trigger the wedge slide. This study uses Newmark displacement method to evaluate the influence for neglecting the vertical acceleration of ground motion firstly. This study uses Newmark displacement method incorporating the rigid wedge method (RWM) and maximum shear stress method (MSSM) to evaluate the influence of wedge deformation. The influences for neglecting the horizontal (perpendicular to the sliding direction) acceleration that incorporating RWM and MSSM are both assessed. In addition, the effects of asymmetric wedges incorporating RWM are also evaluated for neglecting the horizontal (perpendicular to the sliding direction) acceleration. Besides, this research incorporates the velocity-displacement dependent friction law in the analysis to evaluate the influence of constant friction coefficient assumption. Results of this study illustrated that the aforementioned assumptions have significant effects on the calculated permanent displacement, moving speed, and failure initiation. To conclude, this study provides new insights on the initiation and kinematics of an earthquake induced wedge slide.

Keywords: earthquake-induced landslide, wedge slide, Newmark displacement method, rigid wedge method and maximum shear stress method, velocity-displacement dependent friction law

 