Seismic Response of Rock Wedges under Dynamic Loading Revealed by Shaking Table Test

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Rock slope failures are one of the most common natural disasters in Taiwan, and its stability depends upon the slope geometry, geological discontinuity, and mechanical properties of the rock mass, and greatly affected by earthquakes and rainfall as well. In northern Taiwan, the rock wedge exists frequently on the slope of the coastal road, and the rock slope failure is a potential threat to transportation safety.

To investigate the stability and seismic response of rock wedge under dynamic loading such as earthquake, this study adopts the physical model experiment and numerical analysis simultaneously to explore the seismic response of the single wedge block. The geometric factors, including the slope and wedge angles, and dynamic loading with different acceleration are considered. The results of the seismic response are discussed, and the critical acceleration which induces wedge block sliding are compared with the analytical results proposed by Kumsar et al. (2000).

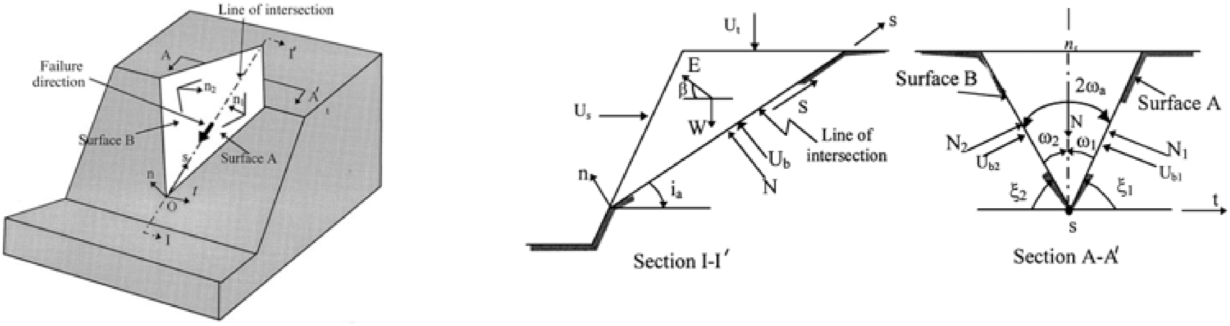
In the physical model experiment, it shows that the smaller slope angle is, the sliding faster wedge block is. In the shaking table test, under the constant interaction angle 27°, the smaller critical acceleration of the wedge block was observed when the slope angle is smaller and the wedge angle is larger, and the numerical analysis consequence presents identical results. Besides, when the slope angle is steeper and the wedge angle is lower, the sliding friction threshold is lower. In other words, when the friction of a fresh joint surface is continuously reduced due to weathering or water seepage, a wedge block with steep slope angle and small wedge angle have less tendency to slide result from lower friction angle.

Keywords: rock wedge, shaking table test, numerical simulation

ϕ : the friction angle of the discontinuity surfaces

i_a : intersection angle

ω_a : half wedge angle



The considered single wedge block model proposed by Kumsar et al. (2000)