On the Dynamic Stability of a Granular Slope

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In our previous study (Uenishi and Goji, *SSJ Fall Meeting*, 2018), in order to deepen our understanding of the fundamental mechanisms associated with dynamic phenomena involving large deformation like landslides due to earthquakes, dynamics of granular media subjected to impact loading has been investigated. In particular, wave and rupture evolution inside the media under dry conditions has been experimentally observed by employing the technique of dynamic photoelasticity in conjunction with a high-speed video camera. Using a digitally controlled laser cutter, penny-shaped birefringent particles have been prepared, and two-dimensional granular slopes consisting of the particles and having different inclination angles have been constructed on a rigid horizontal plane. Impact loading has been applied to each of the slopes on the top horizontal free surface. The experimental observations have clearly indicated that typically there exist two distinct patterns of dynamic failure in granular slopes under consideration: (1) Mass flow and total collapse of the whole slope owing to unidirectional stress transfer; and (2) toppling-like separation of the slope face only, induced by widely spread multi-dimensional waves (Uenishi and Goji, *Proc. Strut. Integrity*, 2018). However, the previous experiments have been performed in the "monolithic" framework and no inhomogeneity in and around slopes has been taken into account.

Therefore, in this contribution, possible influence of material inhomogeneities on the dynamic stability of a granular slope is examined. Firstly, rigid plates are placed over certain boundaries of the granular slopes, and the mechanical roles of confining pressure in the generation of dynamic particle motion, stress transfer and structural collapse are experimentally assessed. Secondly, the open source discrete element code ESyS-Particle is used to numerically reinforce the outcome of the experimental observations and evaluate not only the effects of material stiffness but also those of inhomogeneities like cavities and seismic barriers placed in the granular slopes.

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