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Post-failure characteristics of weathered soils in Korea: determination of rheological thresholds and debris flow mobility

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Landslides in Korea are mainly triggered by localized summer heavy rainfall. The water infiltration, wetting and fluidization process are the key roles in slope instability. Mechanically, a loss in soil strength of the soil at weakend layer takes place as a result of water infiltration. The transition from slides to flows can be defined by the variation in strength parameters. In the flowing stage with large volume of sediments, debris flow impact may be governed by the rheology of the failed mass. We performed the rheological tests using the ball-measuring and vane-inserted rheometer and examined a possible threshold of landslides on mudstone, weathered granitic and gneissic soils in the mountainous region of Korea. The materials examined exhibited the shear-thinning behavior, which is the viscosity decreases with increasing shear rates. There are positive relationships between liquidity index and rheological values (i.e. yield stress and viscosities). However, the difference in rheological properties is of significance for given shear rates. The effect of wall-slip in different geometries is emphasized. This work is also concerned with post-failure characteristics of rainfall-induced landslides that occur in Chuncheon, Miryang and Seoul debris flow occurrence in 2011. They are mainly composed of gneissic, sedimentary and gneissic weathered soils. The rheological properties is helpful to predict the mobilization of fine-laden debris flows. In the relationship between shear stress and shear rate, one of simplest rheological models, i.e. the ideal Bingham fluid model, is selected to examine the flow pattern and depositional features of debris flows. A comparison will be made for the debris flow occurence on weahtered soils in Korea.