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Fluidization process in landslides from failure to post-failure: geotechnical and rheological characteristics

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Previous studies of landslide mechanisms in the literatures (e.g., measurements of shear strength under fully saturated water condition, Cat-scanning or MRI imaging techniques during shearing, normalized rheological strength parameters for fluid, thixotropy model for describing the landslide motion, etc) may help to understand the phenomena of structural change, causing major damaging landslides with a large travelling distance. However, the phase 'transition' from slide to flow, which is treated as a landslide from failure to post-failure associated with a sudden reduction of shear strength, is still poorly understood. To improve our understanding of landslide mechanisms, a fluidization process is thus important related to the strength loss from intact shear strength, through remoulded shear strength, to the yield stress in a mud/debris flow. This process can result from increasing pore water pressure and thereby decreasing effective stress in sliding body, but instead of these factors we would take into account the structural variation due to strength loss during the flow after pre-failure and onset of failure stage. This is one of on-going 'Mountain-Risks' research projects: mechanical analysis of fluidization process in landslides. For this purpose, we first set up the laboratory test method with regard to geotechnical and rheological properties of clayey soils in terms of the strength evolution. The remoulded shear strength/yield stress for clayey soils related to the landslides can be estimated, when linking soil consistency and strength measured from fall cone apparatus and rheology obtained from viscometer. It is due to the fact that, for the mobility analysis of landslides to debris flows, index and rheological properties are one of important correlations. We then concern the thixotropy model for describing a fluidization process from failure to post-failure.