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Fast Shear Behaviour of Granular Material and Rapid Landsliding Phenomena

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Many rapid landsliding events are normally catastrophic in which granular masses flow with extremely low friction. In order to prevent and mitigate the disaster, it is essential to better understand their mechanisms of initiation, motion and deposition. Although a great deal of research and attention has been focused on the unusual physical features for rapid landsliding events, the dependence of frictional properties on particle characteristics and test conditions has not yet been clearly understood. In the present research, we performed a set of experimental studies to examine the grain-scale frictional properties. We used two kinds of glass beads to examine how particle size affected the strength and stability of granular materials by employing a large ring-shear, and sheared the samples by changing the shear rate from 0.1 to 100 mm/s under different normal stresses (50, 100, 200, 400 kPa). It was found that the influence of shear rate on the residual shear strength for glass beads was negligible, while the stress fluctuation was observed for different particle sizes. Three distinct spectral peaks were identified in the frequency spectra for the two glass beads by utilizing Discrete Fourier Transform (DFT) method. According to the frequency spectra, we found that the stress fluctuation of glass beads was closely related to the particle size. Then we analyzed the role of particle size in the fast shear behaviour of granular materials and their relationship to the rapid landsliding behavior of rock avalanche.

キーワード: fast shear behavior, rapid landsliding, glass beads, particle size, shear rate, stress fluctuation
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