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Physical and mineralogical properties and shear strength of landslide soils in Amami-Oshima Island

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Many landslides were triggered by the three heavy rainfalls in the Amami-Oshima Island, Kagoshima Prefecture, Japan in October, 2010, September, 2011 and November, 2011. Especially, the 2010 heavy rainfall from October 18th to 21st was the highest recorded torrential downpour in a century and resulted in triggering 57 landslides that destroyed property and killed three peoples. During recent years, climatic aberrations that result in this type of heavy rainfall have been common and could expect to increase the risk of landslide disasters in the Amami-Oshima Island in the future. The fully-softened, residual and peak strength are important at the time of the occurrence and the re-sliding of landslides. In this study, we examined the physical and mineralogical properties and shear strength characteristics of landslides in Amami-Oshima Island in order to understand the characteristics of landslides clear and the occurrence.

Soil samples were collected from the scarp at the four sites of Ura, Ashikebu, Akinagawa and Sokaru. The Ashikebu sample has high Liquid and Plastic limits and high Specific Surface Area (SSA). All samples were dominated by quartz, and contents mica, feldspar and so on. The Ashikebu sample contained more halloysite and a high percentage of clay. These reasons cause the SSA to be high. There is an inversely proportionate relation between ϕ_r and SSA. It is considered that Ashikebu indicating high SSA showed the low ϕr, and Akinagawa of low SSA showed the high ϕr. The torsional ring shear test was conducted for these two samples. For the Ashikebu sample, the peak strength parameter was obtained to be ϕ_{sf}=38.2˚, residual strength parameter was estimated ϕ_r=17.7˚. For the Akinagawa sample, those were obtained ϕ_{sf}=38.0˚and ϕ_r=28.1˚. In the stress-displacement relations of Ashikebu sample, the shear stress decreased sharply after reaching the peak value, namely fully-softened strength, the attained the residual state at displacement of around 746 mm. The Akinagawa sample exhibited the gradual curvatures and the attained the residual state at a displacement of around 631mm. It is considered that the difference was caused by the mineralogical composition of samples.