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Tertiary Creep of Pore Water Pressure Increase Test in Ring Shear Apparatus

○Atitkagna DOK, Hiroshi FUKUOKA

Fukuzono (1985) found a new method for predicting failure time of a slope based on the findings through a series of large scale flume tests that logarithm of acceleration is proportional to logarithm of velocity of surface displacement immediately before the failure, $d^2x/dt^2 = A(dx/dt)^{\alpha}$. Fukuzono (1985, 1989) proposed a simple method for predicting the failure time by the inverse velocity of surface displacement (1/v), and it is used at many potential landslide sites in the world. However, the mechanism of this behaviour is still unknown. In order to investigate the mechanism of tertiary creep, a series of back-pressure control test were eventually implemented by stress-controlled ring shear apparatus. The tests were conducted under combined conditions of particular normal stress and shear stress with pore-water pressure changes to simulate the potential sliding surface condition in heavy rainfall, which no body experiences undertaking such a test series before.

Mixture of sand and clay material was utilized to simulate actual landslide potential sliding surface. As a result, these tests were succeeded to reproduce tertiary creep to failure, through which the logarithm of acceleration–logarithm of velocity relationship was found to be concave feature of 1/v trend. The range of obtained alpha (α) value partially agrees with that found by Fukozono (1985), Minamitani 2007, and others of similar trend location. The reason of this partial difference could be attributed by (1) finer grain portion, (2) slightly higher rubber edge friction of the shear box compared to previous ring shear tests, (3) increase rate of pore water generation due to time, (4) additionally repeated 1~6 time shear test for a specimen to produce reactivated motion of landsliding.