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NUMERICAL SIMULATION OF A CREEPING LANDSLIDE INDUCED BY A SNOW MELT WATER

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ABSTRACT

In this study, a finite element based numerical method has been considered to evaluate the creeping behavior of a landslide induced by snow melt water. A two-dimensional elasto-viscoplastic constitutive model was used to simulate the creeping behavior owing to groundwater level fluctuations of the Tomuro landslide of Gunma, Japan as a case study. Two new control constitutive parameters were incorporated in the numerical model for the first time to better understand the creeping behavior of a landslide induced by snow melt water. Such control constitutive parameters are estimated based on the relation between the total factor of safety, calculated by the Janbu's Simplified Method (i.e., Limit Equilibrium Method), and the field monitoring displacement rate of the Tomuro landslide of Gunma prefecture, Japan. The snowfall precipitation was also considered during the calculation of total factor of safety. Others required material parameters for landslide simulation were obtained from the field investigation and laboratory tests of the collected blocked samples. The simulation results of deformation pattern and shear strain pattern were presented and discussed to understand the creeping behaviour of the Tomuro landslide. Moreover, the predicted and measured time histories of horizontal displacement of the Tomuro landslide were compared for the validity of the proposed numerical model, and found in good agreements with each other. Therefore, it is believed that the proposed numerical method will be applicable to understand the creeping behavior of a landslide induced by snow melt water in the future and at the same time, long-term monitoring and management of such landslide will be much easier.

KEYWORDS : *Finite element simulation, snow melt water, groundwater level fluctuation, creeping behaviour, Tomuro landslide*

INTRODUCTION

Creeping landslides are one of the major geotechnical hazards. Most of creeping landslide sites accommodate human settlement and agricultural fields, roads and highways, bridges and tunnels, nature conservation sites, and so on (Bhat *et al*., 2017a, 2014a). When the displacement rate of such landslides is suddenly increased and accelerated, then; it leads a huge mass failure which damages