# Prediction of undrained cyclic shear response of saturated sand in the ring shear apparatus

OAurelian Catalin TRANDAFIR, Kyoji SASSA and Hiroshi FUKUOKA

**ABSTRACT**

Analysis of seismic performance of an infinite slope by Newmark's sliding block method is a common engineering practice. In classical formulation, Newmark displacements represent sliding along a well–defined slip surface consisting of a material which exhibits a rigid, perfectly plastic type of shear response. Therefore, a single unique value of yield acceleration, estimated from the pseudo–static limit equilibrium analysis of the potential sliding mass, is used in calculations. However, in the case of an analysis carried out in undrained conditions, the changes in shear resistance associated with the variations in pore water pressure on the slip surface under seismic conditions must be considered.

The present study addresses a modified Newmark procedure to estimate the earthquake-induced undrained displacements of an infinite slope consisting of a saturated cohesionless material on the sliding surface. The proposed methodology utilizes the experimental data provided by the undrained monotonic ring shear test in order to approximate the available dynamic shear strength on the slip surface during earthquakes. The accuracy of this assumption is verified through a comparative laboratory study consisting of undrained monotonic and cyclic ring shear tests on saturated sand with different initial stresses.

The results from undrained monotonic loading are further employed in a numerical study representing an attempt to predict the undrained cyclic shear response of saturated sand in the ring shear apparatus. The same experimental data are also used in sample calculations concerning the undrained behavior of two slopes with different characteristics subjected to various earthquake loadings.

The modified Newmark procedure outlined in this study may be used to predict whether a rapid landslide, which may be associated with a large damage potential, will take place or not under given seismic conditions.

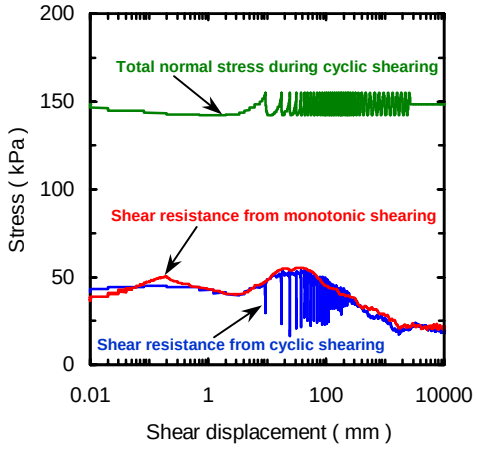


Fig.1. Shear resistance of saturated sand under monotonic and cyclic loading conditions