Large deformation analysis of ground with wall movement or shallow foundation under extremely low confining pressure using PIV

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ABSTRACT

In the recent years, there are growing concerns about geohazards triggered by earthquakes and heavy rainfalls in Japan. Geohazards, such as slope failure and landslide, have caused heavy damages to social infrastructures. Taking an example of the 2016 Kumamoto Earthquakes, which occurred on 16th April 2016, slope failures, landslides and debris flow occurred mainly around the Aso area, causing a lot of damages. In particular, large-scale (deep) landslides occurred in Minami-Aso village Tateno area, and Aso Bridge collapsed completely by this slope failure. In order to minimize the risk of such damages, it is desirable to understand the ground collapse process, scale and range. However, large deformation problem of ground that ranges more than tens of meters has mainly been based on case studies such as literature surveys and ground surveys. Along with these investigations, it is necessary to simulate the destruction process by numerical analysis, and the analysis should be evaluated by practical engineering or physical evaluation.

In order to validate the numerical method, the tracking of the deformation of laboratory test is performed. A deformation measurement method based on Particle Image Verocimetry (PIV) has been used for a tool to geotechnical testing. In the paper, the deformation of ground model with laminated aluminium bars, which resembles the physical property of soil particles, is analyzed with the PIV method. Applying the PIV method to the model tests, the distribution of deformation can be obtained with higher resolution than that of the method using target markers.

By using PIV, accurate results of deformation analysis in model test, that manages the bearing capacity of shallow footing or deformation analysis on retaining wall movement tests, can be obtained. Also comparing the result of PIV and numerical analysis, the validity of numerical analysis about large deformation problem is evaluated from shear strain and load settlement relationship in the ground. Through the examination and comparison of the results of both model test analysis and numerical analysis, the study aim to the approximation of numerical analysis to an actual phenomenon.

REFERENCES
