Inverse-Analysis of Compressibility Properties of Fine-Grained Soils in the GTA

Abulimiti Ayizula[1], Jinyuan Liu*

[1] Department of Civil Engineering – Ryerson University, Toronto, Ontario, Canada
* Corresponding author. Tel: +1-416-979-5000; E-mail: jinyuan.liu@ryerson.ca

Abstract

The Finite Element Method (FEM) has been widely used in geotechnical engineering projects. However, its realistic simulation of real soil behaviour depends on the accurate model input parameters. This study aims to determine through an inverse analysis on the ranges of compressibility parameters of fine-grained soils in the Greater Toronto Area (GTA) according to a popular soil model-the Hardening Soil Model (HSM). These parameters for fine-grained soils in the GTA has not yet fully characterised, which can easily lead to over or underdesign of geostructures in the practice. A series of oedometer test results are collected from a local geotechnical project and backanalyzed by employing the HSM in Plaxis software.

The parameter estimation is carried out using a universal inverse modeling tool-UCODE, which can fit the simulated results with the observed data and obtain the optimized model parameters. First, a sensitivity analysis is performed to select the most critical model parameters in order to simplify the problem. Second, the selected HSM parameters are backanalyzed by UCODE and optimized by minimizing the error between computed and experimental data, see Fig. 1 for typical simulation results. Third, a stastical analysis of the compressibility parameters is presented for different types of fine-grained soils. In the end, a statistical correlation is conducted to estimate the compressibility properties from other soil properties for the applications in the practice.

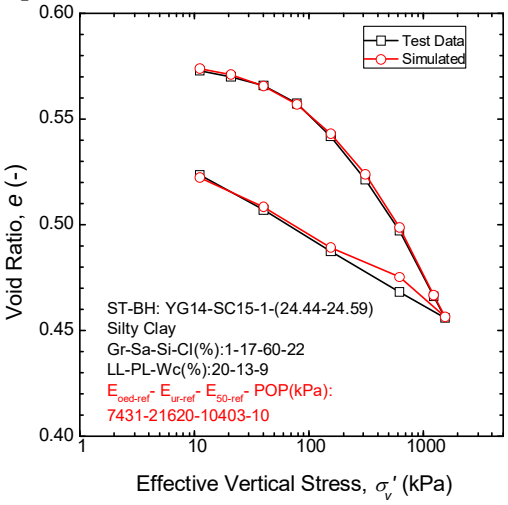

Fig. 1 Example of test data and simulated data through back analysis.

Acknowledgments

This work was supported by the Grant-in-Aid for National Science and Research Council of Canada (DG. 140925).