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Estimation of saturated hydraulic conductivity of Korean weathered granite soils using a regression analysis

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Abstract. Saturated soil hydraulic conductivity is a very important soil parameter in numerous practical engineering applications, especially rainfall infiltration and slope stability problems. This parameter is difficult to measure since it is very highly sensitive to various soil conditions. There have been many analytical and empirical formulas to predict saturated soil hydraulic conductivity based on experimental data. However, there have been few studies to investigate in-situ hydraulic conductivity of weathered granite soils, which constitute the majority of soil slopes in Korea. This paper introduces an estimation method to derive saturated hydraulic conductivity of Korean weathered granite soils using in-situ experimental data which were obtained from a variety of slope areas of South Korea. A robust regression analysis was performed using different physical soil properties and an empirical solution with an R^2 value of 0.9193 was suggested. Besides that this research validated the proposed model by conducting in-situ saturated soil hydraulic conductivity tests in two slope areas.

Keywords: in-situ hydraulic conductivity; Guelph permeameter; regression analysis

1. Introduction

As soil and rock involves necessary uncertainty, it is difficult to evaluate accurately engineering properties, geological conditions, and design parameters. It is also not easy to ensure a representative value that is to be used for stability analysis or design from scattered data. However, when slope stability is evaluated, one representative value is selected from a deterministic method before the calculation and the stability analysis. This approach causes severe individual deviation and is likely to cause overestimation and underestimation in the ground parameter evaluation, consequently leading to a decreased reliability in stability decision. To address this, a probabilistic analysis approach is being used. The probabilistic analysis approach assumes input variables that are used for geo-engineering as probability variables to analyze probability properties identified in the variables and uses probability theory for analysis. The probabilistic analysis can be generally categorized into two stages: one analyzes the probability properties of a ground parameter that determines the probability distribution function based on understanding of the mean value,

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