



Effect of Dry-wet Cycle on the Formation of Loess Slope Spalling Hazards

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Abstract

This paper investigates the effect of dry-wet cycle process on the formation of loess slope spalling hazards. Based on the CT scan tests and macroscopic fissures analysis, the fissure variation law of loess samples under different dry-wet cycle times were determined. Through the laboratory direct shear tests, the variation law of shear strength, cohesion and angle of internal friction of loess samples under different dry-wet cycle times and different dry-wet cycle water content variation ranges were discussed. The results show that the natural water contents of Luo-chuan loess were higher than Tong-chuan loess due to its higher contents of clay particles. With the increase of dry-wet cycle times, the internal fissure numbers of loess samples increased dramatically. The value of shear strength and cohesion of loess samples in two different areas decreased dramatically due to the increase of dry-wet cycle times. Higher water content variation ranges of dry-wet cycles led to lower shear strength of loess samples under the same dry-wet cycle times. Loess slope spalling hazards often happened due to the decrease of shear strength and the occurrence of internal fissures in loess induced by the dry-wet cycle process.

Keywords: Loess Slope; Slope Spalling Hazards; Dry-wet Cycle; CT Scan; Direct Shear Test.

1. Introduction

Loess is one of the wind deposited soils which is widely distributed in the Chinese Loess Plateau covering about $6.3 \times 10^5 \text{ km}^2$, including Gansu, Ningxia, Shaanxi and Henan provinces, etc [1]. Many loess slope spalling hazards happened at Loess Plateau area of China due to the influence of heavy rainfall in the past twenty years (Figure 1) [2-4]. According to the previous research, loess slope spalling hazards can be triggered when water enters into loess slope at a shallow depth, while the saturated zone simultaneously rises from depth [5-8]. The matric suction in unsaturated loess decreased due to the increase of water contents, which induces the decrease of loess shear strength [9-11].

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