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# Monitoring and stability analysis for characterization of the unsaturated slope at a mine waste dump

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In Korea, a shallow slope failure often occurs due to the effect of wetting front to the critical depth by infiltration of rainfall. This failure is mostly triggered by a decrease of shear strength as a process of reducing matric suction induced by the water infiltration after rainfall. To monitor the unsaturated slope at a mine waste dump, a monitoring system for characteristics of the unsaturated slope was installed at a disposal site of mine waste dump in Imgi mine located in Busan, Korea. The tensiometers, piezometrs, and TDR sensors were installed at three different depths under the ground surface. The monitoring was carried out from July 2013 to November 2014 at this site. The maximum daily rainfall during the monitoring period was 234 mm and the maximum hourly rainfall was 87.5 mm/h. The change of volumetric water content of soil showed the tendency to an increase after rainfall by water infiltration and to a gradual decline in the dry season with the most distinguished changes at 0.5 m below the ground surface. The increase of volumetric water content started to increase when the rainfall intensity was 10 mm/h or higher. The matric suction of unsaturated soil increased after rainfall and decreased back in the dry season. The variation of matric suction is the smaller near the surface and a larger variation was observed at the deeper subsurface. For the highest rainfall events, SEEP/W and SLOPE/W simulations were performed and the results showed that the minimum slope stability was calculated as 1.67 and the depth of failure was estimated as 1.5 m after the rainfall event has ended. During the rainy, the slope stability decreased over time until it was reached to 1.59 and the slope stability started to gradually increase when the rainfall has ended. This gradual increase of slope stability seems to be attributed to the increase of effective stress of soil induced by the change of soil from saturated to unsaturated condition, resulting in the increase of matric suction.

Key Words: unsaturated slope, volumetric water content, matric suction, slope stability