

The self-potential variation induced by groundwater flow and the self-potential tomography

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Landslide is one of the most severe natural hazards in the world and there are two types; rainfall-induced landslides and landslides triggered by an earthquake. To understand rainfall-induced landslide process by the self-potential approach, we struggle with the integrated research to clarify the coupling among hydrological, geotechnical, and electromagnetic changes. Our final goal is to develop a simple technology for landslide monitoring/forecasting using self-potential method. The previous laboratory experiments show that the self-potential variation has a relationship with the ground water condition and soil displacements. So, in this paper, we first demonstrate the numerical computations on the self-potential variation by the simulated groundwater flow, and compare the result with those observed by laboratory experiments. In the result, the simulated self-potential variation is consistent with observed one.

Then, we developed self-potential tomography to estimate the ground water condition. And we also characterize the pressure from the self-potential data, and compare the result with observed pressure head that is measured by pore-pressure gauge and found that the inverted pressure head is consistent with observed one. In addition, we apply the self-potential data observed by the flume test. The estimated pressure head from observed self-potential data shows the consistency with observed pressure head. And estimated pressure head also show the characteristic distribution before the landslide occurred. These facts are highly suggestive in effectiveness of the self-potential tomography to monitor groundwater changes associated with landslide. The details will be given in our presentation.

Keywords: Self-potential, Landslide, Tomography