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Sediment-related Disasters Triggered by Severe Rainfall in Fukuoka Prefecture, 2019

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Abstract: In late years heavy rains came to be frequent in the Kyushu region, Japan, and landslides, debris flows, and floods came to occur frequently. In particular, heavy rains occurred around Asakura City, Fukuoka Prefecture, from July 4, 2017 through 7th. This heavy rain caused landslides at many hillside slopes of the Naragatani River basin and Myouken River basin, and a large quantity of earth, sand, and driftwood flowed into the downstream residential area. As a result, 33 people were sacrificed in Asakura City. In the basins such as Naragatani River basin and Myouken River basin, erosion control dams – SABO dams – had been built since the 1970s before this disaster occurred. In addition, the hazard maps for landslides, debris flows, and floods were also created and disseminated. However, serious damage occurred. According to post-disaster surveys, one of the reasons for the severe damages was that total volumes of sediment and driftwood, which were assumed at the time of the plan and construction of the erosion control dams, flowed downstream to residential areas. This report provides an overview of the disasters triggered by the heavy rains in northern Kyushu in 2017, and reports the effects of sediment and driftwood capture by erosion control dams. In addition, aerial photographs taken after the disaster were analyzed to estimate the process of driftwood generation and flow, and the results are reported.

Mineralization Process in Porous Media using Random Walk with Absorption

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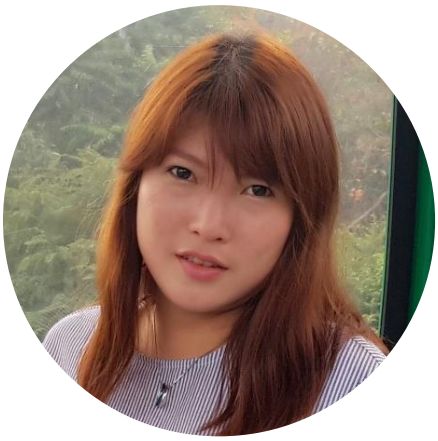
Abstract: The Random Walk with Absorption method is proposed as an algorithm for studying the mechanism of the CO_2 mineralization process in porous media. This problem is a very important problem in geological CO_2 storage because CO_2 mineralization is a promising solution for reducing CO_2 emissions into the atmosphere as an option for the permanent and safe storage of solid carbonates using the Earth. The method is applied to the four kinds of natural rock: Bentheimer, Doddington, Estaillades, and Ketton. Through the method, we investigated the porous structures, the particle flow of carbon dioxide through the porous space in the media, and the mineralization process which is characterized by a parameter called the probability of precipitation. The curved fitting method is utilized to achieve the relationship between the change of porosities of porous rocks during the mineralization process according to time and the probability of precipitation. More precisely, the mineralization processes of all the four nature rock types under consideration have a form of summation of two exponential functions of time (simulation trials). The proposed random walk with absorption method is expected to be used to study the permeability of porous materials in general.

Time-dependent Reduction of Soil Strength and its Implication in Prediction of Time for Slope Failure



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Abstract: Soil creep causes nonrecoverable deformation and eventually reduction of the soil shear strength leading to slope failure when the tertiary creep stage occurred after the duration of constant load application. The life time of creep is significantly depended on the stress levels applied.The proportional relation of decreased stress levels causing failure with increased creep life time is evidence of time-dependent reductions of soil shear strength.The failure time of a soil slope can be predicted by obtaining the logarithmic regression relationship between applied constant deviator stress and time to failure of soil samples during triaxial creep tests; and can be used in designed canculation of geotechnical structures. This paper reviewed characteristic of a creeping slope of inclination 13.8^{o} at Krajang Lor Village, Magelang, Indonesia and using the time-dependent data collected from creep tests of soil samples to predict the life time of this slope. Based on the results, the ultimate long-term creep strength or critical stress level of the soil sample is 75.5% of the soil peak strength. The ultimate time of creep strength reduction of soil sample is 16.84 years. The maximum creep strength reduction ratio of soil sample is 0.37. Currently, with surface loads of approximately 5 kN/m^2, the hightest stress level generated in soil slope is 74.42% of the soil shear strength, indicated that the slope would never come to creep rupture. Nevertheless, stress level could increase up to 75.5% when the surface loads is increased to $100kN/m^2$ and the slope may fail after 16.84 years.

Derivation of SWCC and Permeability Coefficient from Compaction Test Based on Kitamura Model

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Abstract: The soil-water characteristic curve (SWCC) and the relation between permeability coefficient and suction (*kw* ~ *su* relation) are the most important relations for the mechanical properties of unsaturated soil. In this paper the relation between the SWCC, *kw* ~ *su* relation and soil compaction curve are theoretically derived by introducing the concept of effective degree of saturation and applying the numerical model for voids (Kitamura model). Then the soil compaction test on Toyoura sand is carried out to obtain the input parameters required for the numerical simulations of the SWCC and *kw* ~ *su* relation. The SWCCs obtained from the numerical simulations are compared with those obtained from soil tests on sandy soils. It is found that the numerical results are in good agreement with the SWCC and *kw* ~ *su* relation obtained from the soil tests.