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Nat. Hazards Earth Syst. Sci., 10, 1229-1238, 2010

www.nat-hazards-earth-syst-sci.net/10/1229/2010/

doi: 10.5194/nhess-10-1229-2010

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Water-induced granular decomposition and its effects on geotechnical properties of crushed soft rocks

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Abstract. The widespread availability of soft rocks and their increasing use as cheap rockfill material is adding more to geotechnical hazards by increasing time-dependent granular decomposition causes significant damage to the mechanical properties. An experimental study was conducted through monotonic torsional shear tests on crushed soft rocks under fully saturated and dry conditions and compared with analogous tests on standard Toyoura sand. Due to the sensitivity of material to disintegration upon submergence, saturated conditions accelerated granular decomposition and, hence, simulated loss of strength with time, whereas, dry test condition represented the response of the soil with intact grains. A degradation index, in relation to gradation analyses after each test, was defined to quantify the degree of granular decomposition. Possible correlations of this index, with strength and deformation characteristics of granular soils, were explored. Enormous volumetric compression due to consolidation and monotonic loading of saturated specimens and the loss of strength parameters upon submergence were revealed. It was revealed that the observed soil behaviour can be critical for embankments constructed with such rockfill materials. Moreover, the enhancement of existing soil mechanics models to predict time-dependent behaviour by incorporating water-induced granular decomposition can simplify solving in situ geotechnical problems.

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Citation: Aziz, M., Towhata, I., Yamada, S., Qureshi, M. U., and Kawakami, T.: Water-induced granular decomposition and its effects on geotechnical properties of crushed soft rocks, Nat. Hazards Earth Syst. Sci., 10, 1229–1238, doi:10.5194/nhess-10-1229-2010, 2010. [Bibtex](#) [EndNote](#) [Reference Manager](#) [XML](#)