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CRUSHING AND OEDOMETRIC DEFORMATION OF ROCKFILL USING DEM

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The behavior of rockfill may be simulated using the discrete element (particle) modelling. Although its main advantage consists of not requiring the formulation of complex constitutive models, it requires extensive calibration to determine the particle–contact parameters in order to predict the macro-scale response. In this paper, the authors performed computer simulations of crushable agglomerates using distinct element method (DEM). These agglomerates were made by bonding elementary spheres using a stamp logic, in order to provide a statistical variability to the strength and shape of the agglomerates, similar to that of a real rockfill. This method was able to match the Weibull statistics of the crushing strength of real rockfill grains, when tested individually between parallel platens. Then, oedometric tests were simulated and compared quantitatively with the testing data. Several aspects were discussed, particularly, the effect of the loading rate on the position of the compression curves regarding the practical question of performing DEM simulations as fast as possible without creating inertia errors. They are also discussed in relation to characterising crushable rockfill during oedometric compression. These simulations of crushable agglomerates using DEM provides valuable insights concerning the micromechanical origins of rockfill compressibility. Once the model was calibrated through the results of tests performed, it can be used as a virtual laboratory to explore several aspects, as size and shape of the particle's sample. The model was capable of reproducing short-term compressibility (oedometer) tests, but the simulation of long-term compressibility and creep or secondary coefficient are still under development. The model also provided information on the evolution of the grain size distribution during loading of the specimen.