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Numerical Modeling to Validate Theoretical Models of Toppling Failure in Rock Slopes

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Abstract : Traditionally, rock slope stability is carried out using limit equilibrium analysis when investigating toppling failure. In these equilibrium methods, internal forces exerted between columns are not clearly defined, and to the authors' best knowledge, there is no consensus in literature with respect to the results of analysis. A discrete element method-based numerical model was developed and applied to simulate the behavior of rock layers subjected to toppling failure. Based on this calibrated numerical model, a study of the location and distribution of internal forces that result in equilibrium was carried out. The sum of side forces was applied at a point on a block which properly represents the force to determine the inter-column force distribution. In terms of the side force distribution coefficient, the result was compared to those obtained from laboratory centrifuge tests. The results of the simulation show the suitable criteria to select the correct position for the internal exerted force between rock layers. In addition, the numerical method demonstrates how a theoretical method could be reliable by considering the interaction between the rock layers.

Keywords : contact bond, discrete element, force distribution, limit equilibrium, tensile stress
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