Three-dimensional slope stability study using a Coupled Eulerian-Lagrangian method

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In slope stability analysis, two-dimensional (2D) analysis techniques are usually applied due to its simplicity and extensive applicability. Given that slope failures are three-dimensional (3D) in nature, especially in the slope with complex geometry, a 3D slope stability analysis could lead to more reasonable results [1]. In slope stability analyses, limit equilibrium method (LEM) and finite element method (FEM) are widely used. Note that LEM only satisfies equations of statics and does not consider strain and displacement compatibility; FEM may encounter significant mesh distortion during large deformations where convergence difficulty and the analysis may be terminated before the slope reaches failure [2]. In the study, a Coupled Eulerian-Lagrangian (CEL) method, which allows materials to flow through fixed meshes regardless of distortions, was utilized to investigate 3D slope stability [3]. Validation of the numerical modeling was first presented using a typically assumed 3D slope. After the validation, various types of slopes (i.e. turning corners, convex- and concave-shaped surfaces) with various boundary conditions (unrestrained, semi-restrained, and fully restrained) are carefully conducted to examine the 3D slope stability. It is anticipated the 3D analyses can shed some light on the slope stability analysis with extreme or complex geometry cases and provide more reasonable results.

REFERENCE
