

ABSTRACT:

Application of Cosserat Continuum Approach in the Finite Element Shear Strength Reduction Analysis of Jointed Rock Slopes

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ABSTRACT: This paper focuses on the application of a continuum-based method in the Shear Strength Reduction (SSR) analysis of the stability of jointed rock slopes. In order to take into account the jointed nature of the material, the Finite Element Method (FEM) is formulated based on Cosserat theory. Also, it is assumed that failure of the equivalent material can result from failure of the joints, failure of intact material, or a combinatory mechanism. A consistent elasto-plastic algorithm which takes into account the failure of multiple plastic surfaces at the FEM integration points is adopted. The deformation mode, failure mechanism, and factor of safety predicted by the proposed model are verified against two discontinuous models, including the Discrete Element Method (DEM) and the FEM explicit interface model.

The results indicate that the Cosserat continuum approach is a reliable tool for identifying various modes of failure of jointed slope problems. In addition, application of a robust and accurate elasto-plastic algorithm based on the multi-surface plasticity concept enables the method to predict the factor of safety accurately.