Postprint: Evolution Law of Crack Propagation in Creep Fracture of Rock Mass with a Single Fissure

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Abstract

Rock masses contain numerous fractures of varying sizes, forming fractured rock masses with diverse structural configurations. The presence of fractures degrades the mechanical properties of rock masses and significantly impacts the overall stability of rock engineering projects. This study performs theoretical derivation and analysis of creep deformation in rock masses containing a single fracture under constant loading based on the sliding wing crack model. Using MAPLE software, it visually demonstrates the influence of fracture angle and length on creep deformation under constant loading. The continuous-discontinuous numerical analysis software GDEM is utilized to conduct numerical simulations of creep rupture and crack propagation in rock masses with pre-existing single fractures under various inclination angles and lengths. Through theoretical analysis and numerical simulation, it is evident that the creep rate of rock masses increases with increasing fracture length, while exhibiting a trend of initial increase followed by decrease with increasing fracture angle, reaching its maximum at a fracture inclination angle of 30°. Investigations into the creep rupture and crack propagation patterns of rock masses containing a single fracture can provide theoretical foundations and references for research on creep rupture patterns and creep mitigation in rock engineering.

Full Text

Preamble

[The provided text consists primarily of corrupted characters and encoding artifacts that cannot be meaningfully translated. Only the section heading is recoverable.]

Note: Figure translations are in progress. See original paper for figures.