frontiers | Frontiers in Earth Science

TYPE Editorial
PUBLISHED 06 June 2024
DOI 10.3389/feart.2024.1436638

Check for updates

OPEN ACCESS

EDITED AND REVIEWED BY
Gordon Woo,
Risk Management Solutions, United Kingdom

*CORRESPONDENCE
Shuren Wang,
w_sr88@163.com

RECEIVED 22 May 2024
ACCEPTED 30 May 2024
PUBLISHED 06 June 2024

CITATION
Wang S, Liu H, Chang X and Zhang C (2024), Editorial: Instability mechanism and disaster prevention of the jointed rockmass.
Front. Earth Sci. 12:1436638.
doi: 10.3389/feart.2024.1436638

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Editorial: Instability mechanism and disaster prevention of the jointed rockmass

Shuren Wang[1]*, Hongyuan Liu[2], Xu Chang[3] and Chengguo Zhang[4]

[1]School of Civil Engineering, Henan Polytechnic University, Jiaozuo, China, [2]School of Engineering, University of Tasmania, Hobart, TAS, Australia, [3]School of Civil Engineering, Huaqiao University, Xiamen, China, [4]School of Minerals and Energy Resources Engineering, University of New South Wales, Sydney, NSW, Australia

KEYWORDS

jointed rockmass, instability mechanism, cracking behaviors, disaster prevention, reinforcement

Editorial on the Research Topic
Instability mechanism and disaster prevention of the jointed rockmass

Introduction

Discontinuities or joints such as cracks, fissures, faults, foliations and bedding planes resulting from different geological processes are commonly found in rock masses, which often play critical roles in the initiation, propagation, and coalescence of new cracks due to stress redistributions caused by engineering activities and/or natural disturbances. It is challenging to determine the instability mechanism of rock masses with the presence of these joints, i.e., the jointed rock mass, but vital for preventing or at least mitigating the instability disaster of engineering structures constructed in these jointed rock masses.

Correspondingly, the stability and control of the jointed rock mass have become a hot issue in the world. Moreover, the anisotropy of stratified rock mass and the discontinuity caused by structural planes can further induce the instability of the surrounding rock masses of underground engineering structures, such as roadway, tunnel and chamber. Therefore, combining laboratory test, numerical simulation and theoretical analysis, many scholars have studied the mechanical response characteristics of these rocks such as strain energy evolution and acoustic emission by uniaxial cyclic loading and triaxial compression test, the expansion and evolution characteristics of joints and cracks in the rock mass under external loads, and the propagation and energy attenuation characteristics of blasting vibration in tunnel surrounding rock. How to improve the breaking efficiency of these rock masses was also discussed. Therefore, it is necessary to exchange and summarize these achievements in this field.

Progress in the research topic

We then provide a forum for professionals and academics to communicate their impactful research on *Instability Mechanism and Disaster Prevention of the Jointed Rockmass*, which results in the 10 papers being published in this Research Topic that might be of

your interest. These papers mainly cover the following four aspects, such as uniaxial cyclic loading and triaxial compression test of rock and soil samples, experimental study on failure characteristics of stratified and fractured rock mass, blasting vibration propagation and energy attenuation characteristics in surrounding rock masses of tunnels, and evolution process of tunnel instability and prediction of breaking rock efficiency. Please visit the following website for more information: https://www.frontiersin.org/research-topics/52545/instability-mechanism-and-disaster-prevention-of-the-jointed-rockmass/magazine.

Uniaxial cyclic loading and triaxial compression test of rock and soil samples

Zhang et al. studied the mechanical properties and acoustic emission evolution of water-bearing sandstone under deep high stress mining environment under triaxial conditions. Since the rock mechanical properties and strain energy evolution under cyclic loads are obviously different from those under compression, Liu et al. carried out the mechanical properties and strain energy evolution in rocks (coal, white sandstone, red sandstone, and granite) under various types of uniaxial cyclic loading-unloading. Wang et al. conducted long-term cyclic tests for different frequencies on remolded soft clay with different sand contents, investigating how the frequency impacted the stress-strain, the dynamic shear modulus, and the damping ratio of the remolded samples.

Experimental study on failure characteristics of stratified and fractured rock mass

Combining physical model experiments with acoustic emission and moment tensor inversion techniques, Zhang et al. carried out the hydraulic fracturing experiments on the large-size cores under different stress differences to reveal the propagation law of hydraulic fracturing pathway in laminar marl continental shale. Yu et al. conducted the shear failure tests on layered rock masses under different bedding dip angles, different rock bridge width, different normal forces, and forward and reverse shear effects. Moreover, they analyzed the influence of fissure angles and bridge lengths on rock mechanical properties and failure by using the uniaxial compression test and the digital image correlation technique.

Blasting vibration propagation and energy attenuation characteristics in surrounding rock masses of tunnels

During the tunnel construction process using the drilling and blasting method, the induced blasting vibration always poses a great threat to the stability and safety of the supporting structure of adjacent tunnels. To improve the efficiency and safety of tunnel blasting construction, Qin et al. investigated the vibration propagation and peak particle velocity (PPV) distribution of the lining of an excavated tunnel during the blasting of an adjacent tunnel. They analyzed the evolution process and distribution characteristics of the PPV of the lining of adjacent tunnels. Lan et al. conducted on-site experiments and numerical simulations to reveal the influence of the number of free surfaces on the energy distribution and attenuation law of surrounding hole blasting vibration signals.

Evolution process of tunnel instability and prediction of breaking rock efficiency

These natural defects (cracks, faults and cavities) will have an impact on the stability of tunnels. Li et al. investigated different conditions of surrounding rock: intact surrounding rock, surrounding rock with open-flaw and surrounding rock with filled-flaw under the true triaxial test. They explored the effect of different surrounding rock conditions on the internal failure characteristics of tunnel under true triaxial conditions. A simple and accurate evaluation method of the rock-breaking efficiency of TBM disc cutters is an essential prerequisite to improve the rock-breaking performance of TBM. Zhou et al. summarized the classical force prediction equations of disc cutters and analyzed the applicability of each equation for the constant cross-section disc cutters.

We hope that these articles provide readers with valuable information on recent developments in science, technology, and related researches for achieving the goals of *Instability Mechanism and Disaster Prevention of the Jointed Rockmass*.

Author contributions

SW: Writing–original draft, Writing–review and editing. HL: Writing–review and editing. XC: Writing–review and editing. CZ: Writing–review and editing.

Funding

The author(s) declare that financial support was received for the research, authorship, and/or publication of this article. This work was financially supported by National Scholarship Fund of China (2023)-21, Key Project of Natural Science Foundation of Henan Province, China (232300421134), First-Class Discipline Implementation of Safety Science and Engineering (AQ20230103), Zhongyuan Science and Technology Innovation Leading Talent Program (244200510005), China.

Acknowledgments

We thank the various authors for submitting their work to this Research Topic and the reviewers who agreed to review individual contributions.

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The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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