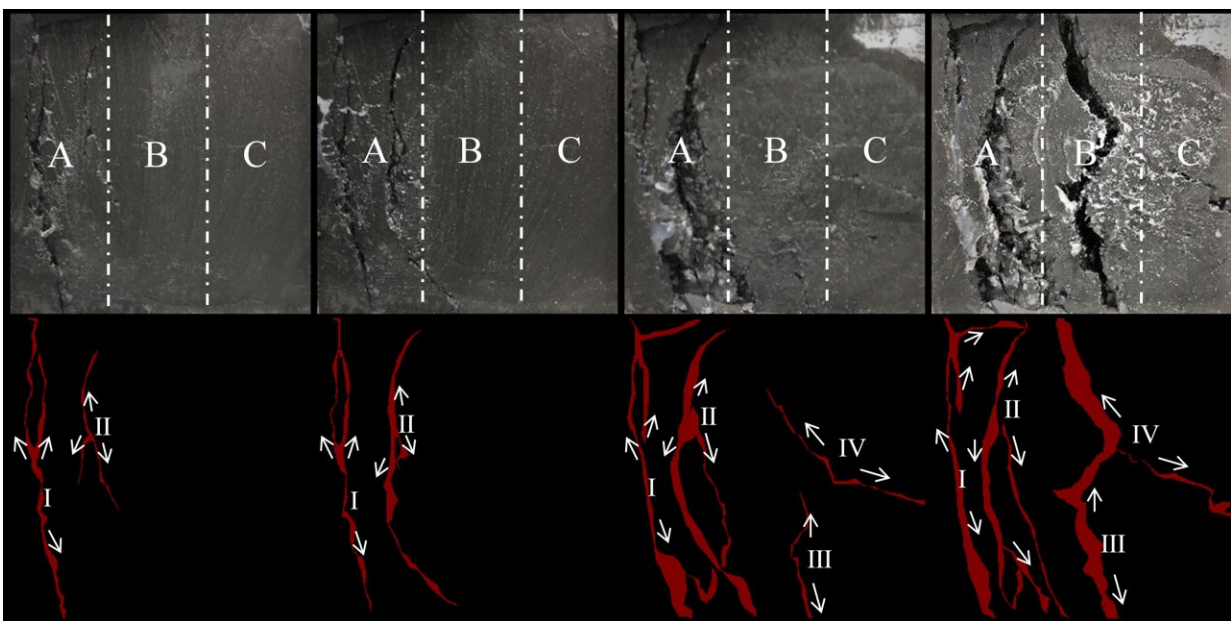


Researchers reveal influence of cyclic dynamic disturbance on coal-rock evolution and zoning

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Crack evolution law of coal-rock. Credit: Yihong Liu, et al

In coal-rock formations, many micro-fractures exist, and the expansion of these micro-fractures is the internal catalyst for the macroscopic destruction of coal-rock. Moreover, the occurrence state of gas changes with the expansion of micro-fractures. In engineering practice, most coal-rock mass needs cyclic operation in the blasting excavation or mechanical drilling, and the dynamic load of coal-rock mass is cyclic

impact load.

In a new study [published](#) in the journal *Geohazard Mechanics*, a group of researchers from China revealed the damage process of coal-rock under dynamic and static loads.

"Engineering rock masses are in a certain static load constraint environment before bearing dynamic loads, such as the excavation face (bidirectional) of tunnels and the coal mining face (unidirectional). For deep mining situations, high ground stress causes significant changes in the critical impact resistance of rock materials," explains one of the study's authors, Professor Wang Aiwen from the Institute of Disaster Rock Mechanics at Liaoning University.

"Therefore, studying the impact resistance of rock masses under different static load constraint conditions has important guiding significance for engineering practice."

The team discovered that the presence of local static load constraint enhances the impact resistance of coal-rock, and the damage evolution of coal-rock exhibits distinct zoning characteristics. "With the local static load constraint, the crack propagation in coal-rock also exhibits pronounced zoning features, primarily manifesting as tensile cracks on the surface. Furthermore, the zoning patterns of the damage factor and macro crack growth demonstrate a remarkable consistency," adds Wang.

According to lead author Dr. Liu Yihong, this is a new discovery in the damage characteristics of coal-rock under dynamic and static loads. He says, "To date, there has been no report on the impact of dynamic impact on coal-rock under non-uniform static load constraint. We hope that our findings encourage scholars to continue studying the dynamic failure mechanism of coal and rock under local static load constraints, in order to guide the protection work of engineering [rock](#) masses."

More information: Yihong Liu et al, Influence of cyclic dynamic disturbance on damage evolution and zoning effect of coal-rock under local static load constraint, *Geohazard Mechanics* (2023). [DOI: 10.1016/j.ghm.2023.10.001](https://doi.org/10.1016/j.ghm.2023.10.001)

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