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Microseismic monitoring and characteristic analysis for underground coal mining: A case study from Xiaobaodang coal mine, China

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Coal mining disrupts the stress equilibrium of the surrounding rock mass, and the rock mass cracks as a result of the changes in the stress field, releasing strain energy and causing microseismic events. Monitoring seismicity during coal mining is critical for ensuring safe production and preventing geological disasters. In this study, we deployed 29 surface seismic nodes above an underground coal mine in the Yulin region of Shaanxi Province, China, to monitor the mining operation for 665 hours. A large number of microseismic events have been detected from continuous monitoring data, and analyzed using event clustering, source location, and mechanism estimate. The results show that (1) the frequency and intensity of microseismic events are related to underground mining working conditions; (2) the temporal and spatial locations of the microseismic sources may be utilized for real-time tracking the location of the underground coal mining face; and (3) three rupture mechanisms of tension rupture, implosion rupture, and shear rupture reflect the triggering mechanisms of the coal pillar failure, roof breakage and movement and fault slip.