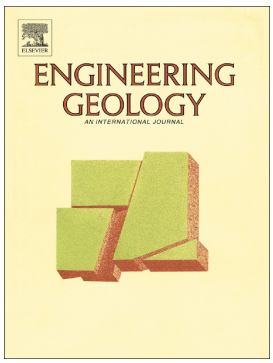

Microseismicity monitoring and failure mechanism analysis of rock masses with weak interlayer zone in underground intersecting chambers: A case study from the Baihetan Hydropower Station, China

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Microseismicity monitoring and failure mechanism analysis of rock masses with weak interlayer zone in underground intersecting chambers: A case study from the Baihetan Hydropower Station, China

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Abstract: A weak interlayer zone (WIZ) is a rock mass system with poor mechanical properties, large-scale random distribution, water softening, causing an adverse effect on the safety of the construction and project progress. To investigate the fracture process and the mechanism of rock masses with WIZs in the intersecting chambers during the excavation process, *in situ* microseismic (MS) monitoring was carried out in the underground powerhouse on the right bank of the Baihetan Hydropower Station, China. During the monitoring, the spatio-temporal evolution process of the microseismicity of the rock masses around the intersecting chambers was obtained during the excavation unloading of multiple working faces. The spatial evolution of MS events illustrates the dynamic progressive characteristics of MS activities as they propagate and accumulate along the WIZ and finally form a cluster zone. The fracture mechanism of moment tensor inversion reveals the distribution and evolution of MS events with respect to different fracture types: tensile fracture events are distributed near the free surface while non-tensile fracture events are far from the free surface. Finally, the study proposes support measures restraining fracture development in surrounding rock masses with WIZ. The Effectiveness of reinforced support measures is verified by MS events and the deformation of surrounding rocks. The results of the study are particularly valuable for the stability analysis, excavation, and support optimization of similar engineering studies.

Keywords: weak interlayer zone (WIZ), intersecting chambers, microseismicity, spatio-temporal evolution, fracture mechanism, Baihetan Hydropower Station.