Interaction of a hydraulic fracture with parallel pre-existing fractures

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Formation and growth of hydraulic fractures can be strongly affected by pre-existing fractures in the rock mass. Until now the main attention was directed towards the investigation of the interaction between the hydraulic fracture and the pre-existing fractures intersecting its path, as they could significantly hamper its formation and growth, alter the geometry and produce additional leak-off. Less attention was paid to the interaction of the hydraulic fracture with parallel and coplanar pre-existing fractures, yet their interaction and coalescence can lead to unwelcome increase in the hydraulic fracture dimensions, change the direction of growth and in some cases result in undesirable effects such as environmental damage.

In order to investigate the hydraulic fracture interaction with parallel pre-existing fractures we conducted a series of tests on transparent rectangular samples with two artificial cracks. One of the crack was loaded with pressurised fluid. The types of interaction were classified and the conditions of fracture coalescence formulated. The results will contribute to the understanding of hydraulic fracture propagation in fractured rock masses and mitigating environmental damage.

Acknowledgements. Wang acknowledge support from the Natural Scinece Foundation of Jiangsu (BK20171130). The AVD and EP acknowledge support from the Australian Research Council through project DP190103260. AVD acknowledges the support from the School of Civil and Transportation, Faculty of Engineering, Beijing University of Civil Engineering and Architecture. Wang acknowledge support from the National Natural Science Fund (51409170,U1765204)
