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Growth of an isotropic cluster of activated fractures in the presence of stress anisotropy MOHAMMED ALHASHIM, DONALD KOCH, Cornell University — Hydraulic stimulation of low permeability rocks via hydroshearing of pre-existing fractures is widely used in the oil/gas and geothermal industries. Optimization of this process requires deep understanding of the interplay between fluid transport and permeability changes due to the growth of a cluster of activated fractures. The effects of network connectivity, pressure-driven flow of the fracturing fluid, and stress anisotropy on the cluster growth are analyzed. To delineate the effects of the network's connectivity, pre-existing fractures are modeled as line segments of uniform length that are randomly oriented. To capture the effects of fluid transport, we use discrete network simulations of the stimulation process. We show that the effects of stress anisotropy, which tend to produce a quasi-one-dimensional network, can be mitigated by fracturing in such a way that the viscous pressure drop required to drive the injected fluid becomes important over a length scale that is comparable with the pre-existing fractures' correlation length. This result provides a criterion to increase the ramification of the induced hydraulically conductive flow paths by optimal design of the fracturing process.

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