**The Influence of Natural Fractures on Hydraulic Fracture Propagation**

Olson, Jon [1]; Dahi Taleghani, Arash [1] (1) Petroleum & Geosystems Engineering, The University of Texas at Austin, Austin, TX.

Complex hydraulic fracture geometry has become more evident with the widespread application of improved fracture diagnostic technology. Multi-stranded fracture propagation from vertical wells has been confirmed by coring, while microseismic data in naturally fractured reservoirs such as the Barnett Shale suggests significant diversion of hydraulic fracture paths due to intersection with natural fractures. Mechanical interaction between a propagating hydraulic fracture and pre-existing natural fractures seems to be the key component explaining why some reservoirs exhibit more complex behavior. There are several possibilities for the interaction between hydraulic and natural fractures. The likelihood of intersection between a hydraulic and natural fracture is partly a function of orientation. If the hydraulic and natural fracture directions are parallel, intersection is less likely, but there can still be interaction between close, en echelon overlaps of fractures, and the natural fractures may be reactivated by being within the process zone (region of altered stress) around the crack tip. If the natural fractures are orthogonal to the present-day hydraulic fracture direction, the propagating hydraulic fracture is likely to cross a large number of natural fractures as it propagates through the reservoir. Analytical results are presented to predict whether a hydraulic fracture will arrest, divert or continue across natural fractures when intersected. Numerical results are presented to show potential complex, multi-stranded hydraulic fracture geometries in naturally fractured reservoirs from single or multiple injection points. Examples include cases where the hydraulic fracture direction is sub-parallel to the natural fracture strike as well as perpendicular.