HYDRAULIC FRACTURE HEIGHT LIMITS AND FAULT INTERACTIONS IN TIGHT OIL AND GAS FORMATIONS

Samuel A. Flewelling*
Matthew P. Tymchak
Gradient
20 University Road
Cambridge, MA 02138
540-894-5434
sflewelling@gradientcorp.com

The widespread use of hydraulic fracturing (HF) has raised concerns about potential upward migration of HF fluid and brine via induced fractures and faults to shallow potable groundwater. We developed a relationship that predicts maximum fracture height as a function of HF fluid volume. These predictions generally bound the vertical extent of fracture growth and fault movements observed from over 12,000 HF stimulations across North America monitored with microseismic sensors. All microseismic events were less than 600 m (~2,000 ft) above well perforations, although most were much closer. Areas of shear motion (including slip along faults and joints) estimated from microseismic data were comparatively small (radii on the order of 10 meters or less). These findings suggest that fracture heights are limited by HF fluid volume regardless of whether the fluid interacts with faults. Direct hydraulic communication between tight formations and shallow potable groundwater via induced fractures and faults is not a realistic expectation based on the limitations on fracture height growth and potential fault slip.

###