1189857 Variability of Hydraulic Fractures in Shale or Tight Gas Reservoirs

Baig, Adam M.[*1]; Urbancic, Ted [1] (1) ESG Solutions, Kingston, ON, Canada.

Hydraulic fracturing is an important process to liberate hydrocarbons in low permeability reservoirs like shales and tight sands. The fractures are designed to have a certain shape taking into account the geology as well as different fluids, different composition slurries, and type of proppants. Models of these fractures are usually simplified to a single vertical feature that progresses symmetrically away from the treatment well. Nevertheless, these models predict geometrical parameters of the fracture like the azimuth (in the direction of SHmax) and the half-length.

Direct observation of the growth of these fractures is possible through microseismic monitoring. A typical configuration included deployment of a downhole sensor array in a well close to the treatment such that the microseismicity will have high enough signal-to-noise on the sensor array. Because the minumum detectable magnitude varies with the distance from the array, to get an unbiased view of the event distributions, it is necessary to remove events lower than a magnitude of completeness: the minimum magnitude detectable across the whole treatment zone.

We present a comparison of a number of hydraulic fracture monitoring programs in shale and tight gas reservoirs. Accounting for a representative dataset, there is a tremendous amount of variability in the fracture trends and distributions within the same formations. The prediction that fractures grow in two symmetric vertical wings away from the treatment zone is rarely observed. Instead, the treatment and the events themselves create a very dynamic stress field that interacts with the heterogeneity in the reservoir to locally control the trend of the observed event distributions.

No full paper available