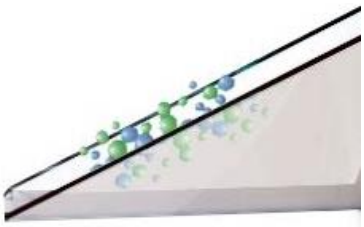
How Planar Hydraulic Fracturing Models Fall Flat, Episode 1:

Are your Planar Frac Models causing financial pain?

Perhaps the assumptions in the planar model do not apply to real hydraulic fractures in the field. Do hydraulic stimulations in tight unconventional rocks really make smooth walled singular fractures?



Mode 1 (tensile) Natural fractures can show us some of the ways that rock breaks, especially in layered sedimentary rocks. In the shale below, plumose ridges are highlighted by chalk, with hackles to the right and beyond that several long, curved arrest marks.

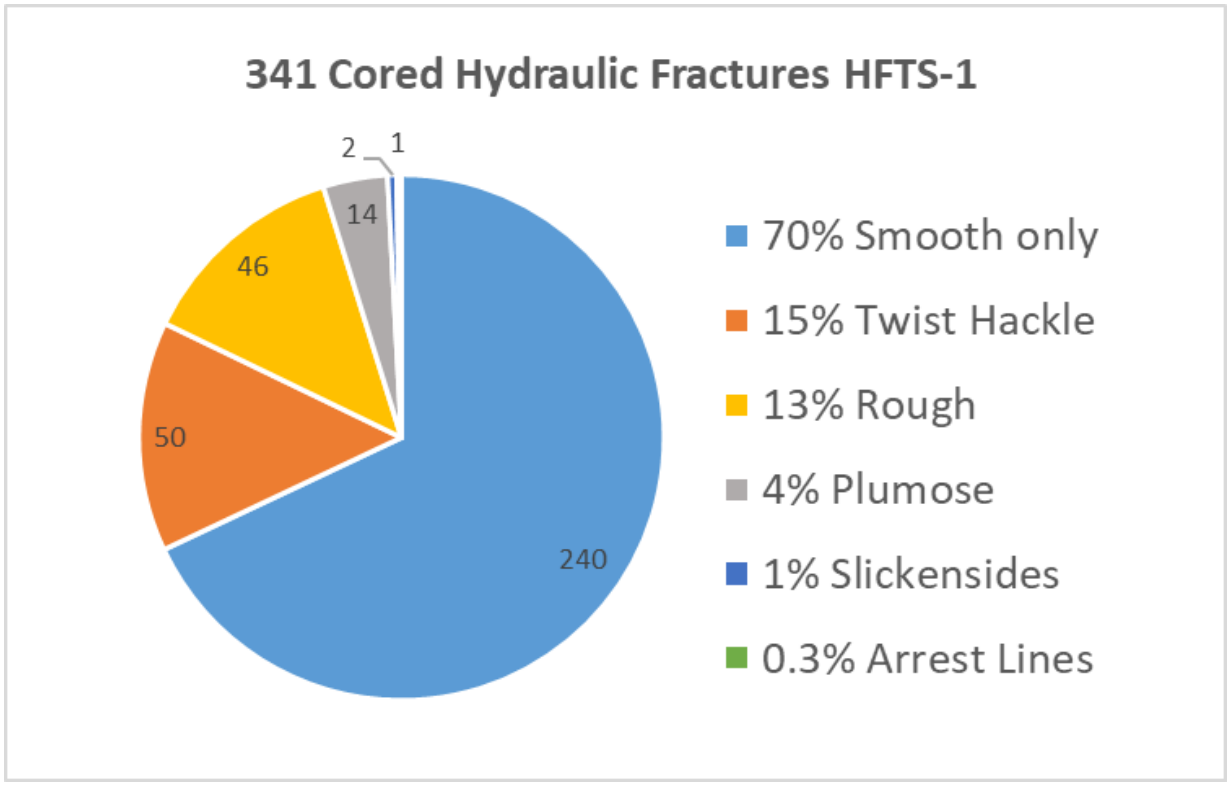
Re-pressurization of this fracture (from the cracking of oil to gas) can cause further propagation to the right, but the plumose, hackles and arrest marks will remain. In some cases, hackles can grow into long curved steps.

Propagation across bedding planes can result in vertical steps as seen in the Redwall Limestone in the Grand Canyon.

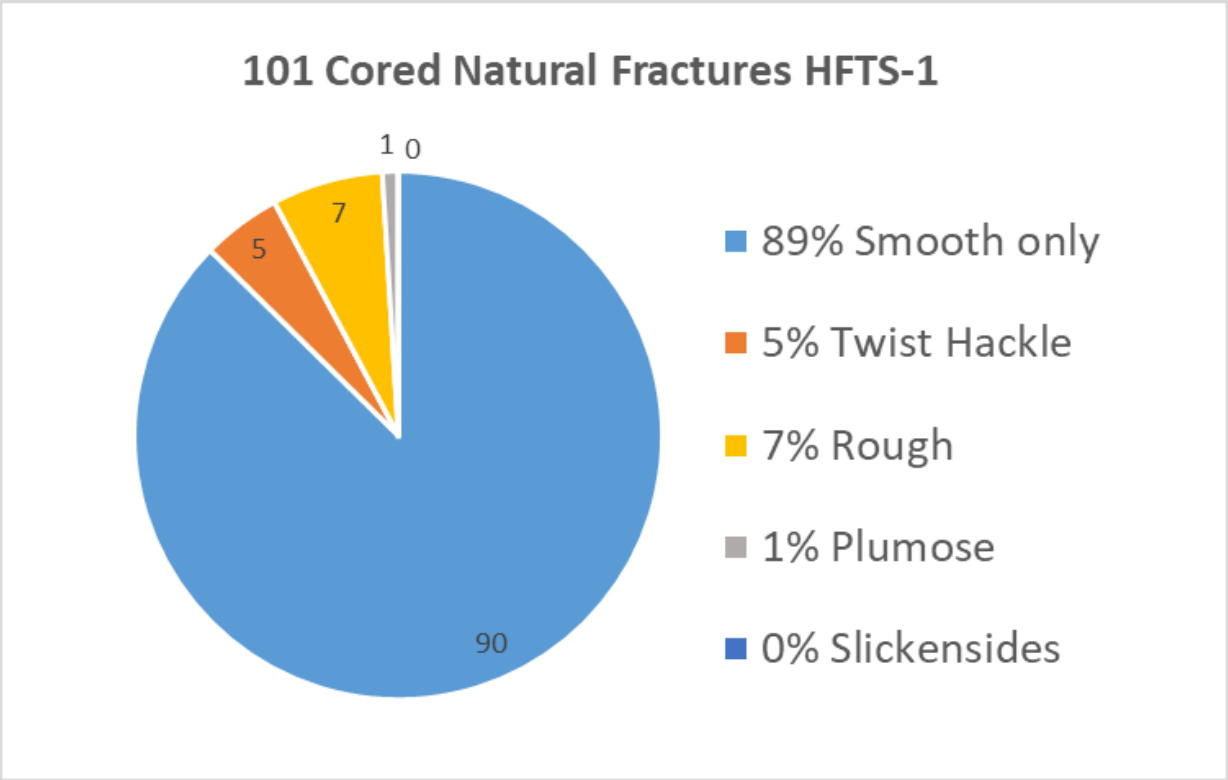
600 feet (180m) of core in the Midland Basin of Texas show that Hydraulic Fractures in the Wolfcamp have many of the features that are seen in outcrops of natural fractures.

From Julia Gale et al, Bureau of Economic Geology Final Report

Fractures described by the Bureau of Economic Geology show that 30% of the cored hydraulic fracture surfaces have rough features.



The described natural fracture surfaces in the same core have a lower proportion of rough features.



This data supports that many of the surface features of natural fractures are present in hydraulic fractures.

Episode 2: When Fractures get Rough will examine the impact of fracture roughness.

References:

GTI-NETL Hydraulic Fracturing Test Site (HFTS) Project #DE-FE0024292, HFTS-1 Phase 1 Slant Core Well Reports, 2020-03-02, https://edx.netl.doe.gov/dataset/hfts-1-phase-1-slant-core-well-reports

GTI-NETL Hydraulic Fracturing Test Site (HFTS) Project #DE-FE0024292, HFTS-1 Phase 1 Slant Core Well Proppant Analysis, 2020-03-02, https://edx.netl.doe.gov/dataset/hfts-1-phase-1-slant-core-well-proppant-analysis