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Influence of Fault Modeling Parameters on a Simple Injector-Producer Pair

Predictive models of the impact of faults on hydrocarbon recovery are needed to help reduce risk in developing faulted reservoirs. While existing reservoir modeling and simulation software cannot capture the geologic complexity of faults, faults acting as seals or flow baffles may be introduced into a simulation model by modifying the transmissibility between model cells juxtaposed by faulting. Although commercial reservoir simulators are flexible enough to handle different transmissibility multipliers between each pair of juxtaposed grid cells, in practice it is time consuming and non-systematic to make these adjustments. As a result, a single transmissibility multiplier is typically applied to an entire fault, ignoring its true geologic complexity. More realistic models of the faulted reservoir can be built by using geologically motivated transmissibility multipliers with fault properties derived from core and outcrop analogs.

Using streamline and conventional reservoir simulation, we examine the impact of a single fault on an injector-producer pair. We systematically tested three different methods for assigning fault properties: 1) applying a single transmissibility multiplier to the entire fault, 2) assigning fault permeability base on the rock types juxtaposed across the fault, and 3) calculating fault permeability from shale gouge ratio. While it is possible to match well bottom hole pressures and oil production rates using all three methods, different approaches to modeling faults and the parameters chosen for each method significantly change the reservoir drainage patterns, preferred flow paths through the reservoir, and ultimate hydrocarbon recovery.