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Improved geomechanically-based fracture models

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At present fractured reservoirs are typically modelled either by modifying the bulk rock properties to take account of the fracture porosity and permeability, or using stochastically generated Discrete Fracture Network models (DFNs). Both methods tend to give a poor history match because the distribution, orientation, length and connectivity of fractures in the subsurface are not well constrained.

To solve this problem, we have developed a new method of characterising fractured reservoirs and building DFNs by simulating the process of fracture nucleation and propagation based on geomechanical principles. In this presentation, we will show how this model can replicate some of the complex fracture geometries observed in outcrops of chalk and other lithologies. In particular, we will examine the controls on the fracture length distribution, the fracture density and the fracture anisotropy. These are all factors that will influence the fracture permeability.

Finally, we will show how variations in the mechanical properties control the timing of fracture nucleation and the rate of fracture growth. We will show how this can be used to quickly generate multiple fracture models that capture the range of uncertainty in fracture patterns.