Scale discrepancy paradox between observation and modelling in fractured reservoir models in oil and gas industry.

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Naturally fractured reservoirs represent one of the most challenging resource in the oil and gas industry. The understanding based on centimeter scale observations is upscaled and modeled at 100-meter scale.

In this paper, we will illustrate with case study examples of conceptual fracture model elaborated using static and dynamic data, the disconnect between the scale of observation and the scale of modelling. We will also discuss the potential disconnect between the detail of fundamental, but necessary, research work in universities against the coarse resolution of the models built in the oil industry, and how we can benefit of the differences in scales and approaches.

The appraisal and development of fractured reservoirs offer challenges due to the variations in reservoir quality and natural fracture distribution. Typically, the presence of open, connected fractures is one of the key elements to achieve a successful development. Fracture modelling studies are carried out routinely to support both appraisal and development strategies of these fractured reservoirs.

Overall fracture modelling workflow consists first of a fracture characterization phase concentrating on the understanding of the deformation history and the evaluation of the nature, type and distribution of the fractures; secondly of a fracture modelling part where fracture properties for the dynamic simulation are generated and calibrated against dynamic data. The pillar of the studies is the creation of 3D conceptual fracture diagrams/concepts which summarize both the understanding and the uncertainty of the fracture network of interest. These conceptual diagrams rely on detailed observations at the scale of the wellbore using core and borehole image data which are on contrasting scale compare to the 10’s of meters to 100’s of meter scale of the grid cells of the dynamic models used for the production history match and forecast. These contrasting scales will be the thread of the presentation.