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Multiphysics of Fractured Reservoirs in a Unified Modeling Environment

Thursday, 2 June 2022 15:00 (15 minutes)

Modeling flow, transport, and mechanics in naturally fractured reservoirs is a challenging task. On the one hand, the properties of such reservoirs can only be described on the basis of limited measurement data and these are therefore also subject to uncertainties. On the other hand, a computer model should still be able to represent the typical characteristics.
One approach to tackle the uncertainties in fractured reservoirs is using discrete fracture network (DFN) modeling. In this process, the properties of the fractures such as position, orientation, shape, and aperture width are described with the help of statistical distribution functions and represented in the computer model. The underlying equations are then solved on the generated fracture set(s) (which are realization(s) of the DFN model) and, if required, also in the surrounding matrix.
We present a holistic approach to multiphysics modeling of fractured reservoirs, where the geometric representation, the physical processes, the postprocessing, and evaluation take place in the single simulation environment of COMSOL Multiphysics®. Using the example of fractured reservoir flow, we demonstrate how the software can be used to generate discrete fracture networks, with fracture distribution, size, orientation, and aperture following different distribution functions such as power law and Fisher distribution. In the next step, we show how the physical effects, such as flow and heat transport, can be considered. Interactions with the surrounding matrix are also accounted for.
After solving and evaluating the results, we briefly discuss the current limitations and future development tasks within this approach. The advantage of the underlying implementation is that it can be extended and thus adapted to a variety of tasks in the field of modeling fractured reservoirs and fractured porous media in general.

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References

Time Block Preference

Time Block A (09:00-12:00 CET)

Participation

Online

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