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Title **The Fracture Characterization and Fracture Modeling of a Tight Carbonate Reservoir: The Najmah Sargelu of West Kuwait**
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Abstract

This paper presents an innovative and promising, multi-discipline integrated approach that includes geology (BHI, cores, wireline logs), geophysics (seismic facies analysis), and reservoir engineering data (production data, PLT, welltest) that were combined to identify the main types of fractures, to predict their occurrence in the reservoir and to determine the hydraulic properties of the different fractures sets

The Najmah – Sargelu of West Kuwait is an oil bearing reservoir made of tight carbonates where porosity and permeability is mainly provided by the fracture network. In this paper, we will first introduce the method used to identify and predict the two main scales of fractures: joints and large-scale fractures (faults and fracture swarms). The shale content (Vshale) and mechanical beds thickness were found to be the two main geological drivers on joints occurrence. Thickness of individual beds were recorded from BHI acoustic images which enabled to measure an S/T ratio (fracture spacing to bed thickness) for each fracture set and for different shalyness. Secondly, we used an innovative solution to deliver an accurate map of large-scale fractures location. This approach uses concurrently a set of selected fracture relevant attributes in a multi-variable statistical process called Seismic Facies Analysis (SFA).

A 3D stochastic fracture model was then generated incorporating the two scales of fractures and constrained by the reservoir shalyness, the S/T ratio and the seismic facies map. The calibration of the hydraulic properties of the fractures was achieved through the second innovation presented in this paper: the simulation of a synthetic well test using the 3D fracture model and matched with the real data. This resulted in the calibration of the hydraulic fractures conductivity for each fracture type. These values were combined with the 3D stochastic fracture model to produce 3D fracture properties models (porosity, permeabilities and block size) for the Najmah – Sargelu of West Kuwait.