# Fracture network modelling for shale rocks – a case study from the Baltic Basin

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The discrete fracture network (DFN) approach offers many key advantages over conventional dual porosity approaches when the geometry and properties of discrete fractures play a significant role in geomechanics, and resource assessment (Dershowitz & Doe 1988). A comparison of the simulated data to real fractures observed on core samples increases confidence in the DFN approach.

A DFN model typically combines deterministic and stochastic discrete fractures. The deterministic fractures are those directly imaged through seismic or intersected by wells. Other, usually smaller-scale fractures may not have been detected through seismic, yet may be very important for reservoir performance. These fractures are generated stochastically (Parney et al. 2000).

The aim of this study is prediction of fracture properties for the Lower Palaeozoic shale rocks. The input data included seismic survey data, and well logs with FMI interpretation that were calibrated with measurements and observations on the cores to ensure accuracy in the estimates of fractures properties. This study was performed using Petrel software from Schlumberger. Typical workflows for modelling of oil and gas reservoirs were applied (e.g. Zakrevsky 2011). The result was a 3D fracture distribution model consisting of four zones. In each zone two generations of fractures were modelled based on well log data. Several seismic attributes were additionally considered as fracture density drivers for the spatial modelling. Finally, the ant tracking structural attribute was chosen as the best indicator of faults and fractures in a seismic cube. To improve the quality of the DFN model, should define the local stress distributions.

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## REFERENCES

Dershowitz W.S. & Doe T.W., 1988. Practical applications of discrete fracture approaches in hydrology, mining, and petroleum extraction. *International Conference on Fluid Flow in Fractured Rocks, Atlanta*, 381–396.

Parney R., Cladouhos T., La Pointe P. & Dershowitz W., 2000. Fracture and Production Data Integration Using Discrete Fracture Network Models for Carbonate Reservoir Management, South Oregon Basin Field, Wyoming. *SPE Rocky Mountain Regional/Low-Permeability Reservoirs Symposium and Exhibition, 12-15 March, Denver, Colorado*, SPE-60306-MS.

Zakrevsky K.E., 2011. *Geological 3D Modelling*. European Association of Geoscientists & Engineers Publications B.V.

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