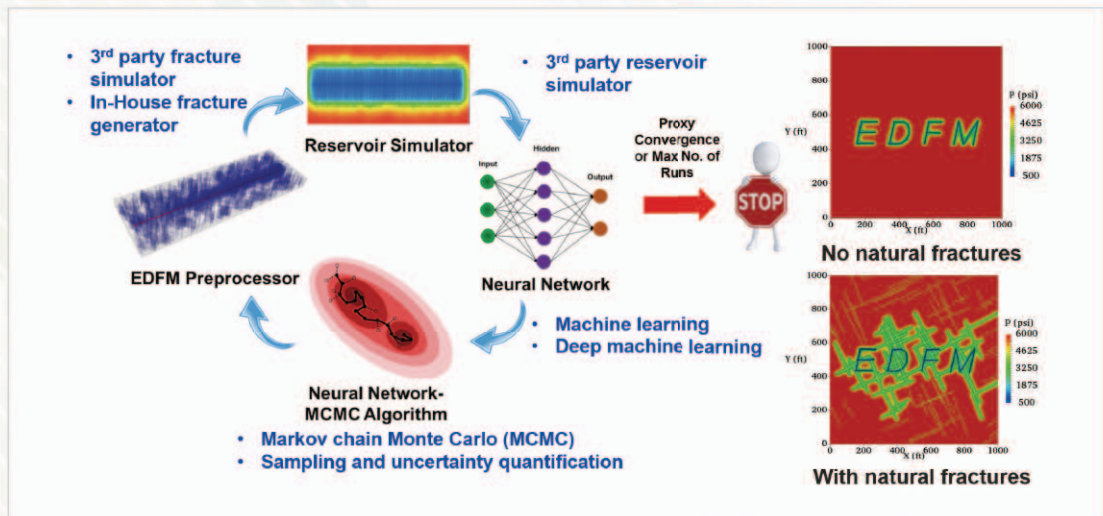# EDFM-AI

for Automatic History Matching and Well
Spacing Optimization in Shale Reservoirs
with Complex Hydraulic and
Natural Fractures

Hydraulic Fracture Calibration

SIMTECH®

EDFM-AI for Automatic History Matching and Well Spacing Optimization in Shale Reservoirs with Complex Hydraulic and Natural Fractures

EDFM-AI for automatic history matching framework for shale reservoirs with complex fractures

## Highlights for EDFM-AI for Automatic History Matching (AHM) in Shale Reservoir

◆ 10 years of continuous development and many field applications in the Permian Basin, Eagle Ford, Niobara, Bakken lead to the first commercialized EDFM-AI AHM in the world.

◆ Handles any complex hydraulic and natural fractures effortlessly and efficiently. Couples fracture models and reservoir models to perform Automatic History Matching.

◆ Provides multiple History Matching solutions in few hours including natural fractures impact.

◆ Reduces subsurface uncertainties (e.g. effective fracture and matrix properties) and estimates production forecast reliably.

◆ Provide assessment for infill well placement and optimal well spacing more accurately.

| Fractures Model	Analytical Model	Continuum Approach	Local Grid Refinement (LGR)	Embedded Discrete Fracture Model (EDFM)
Accuracy	✓	▬	✓	✓
Flexibility	✗	✓	▬	✓
Computational Effort	✓	✓	✗	✓

| History Matching Algorithm	Optimization-Based Methods	Ensemble Kalman Filter (EnKF)	Markov Chain Monte Carlo (MCMC)	Proxy-based Markov Chain Monte Carlo
Accuracy	✗	▬	✓	✓
Computational Effort	✓	✓	✗	✓

EDFM-AI for automatic history matching framework for shale reservoirs with complex fractures
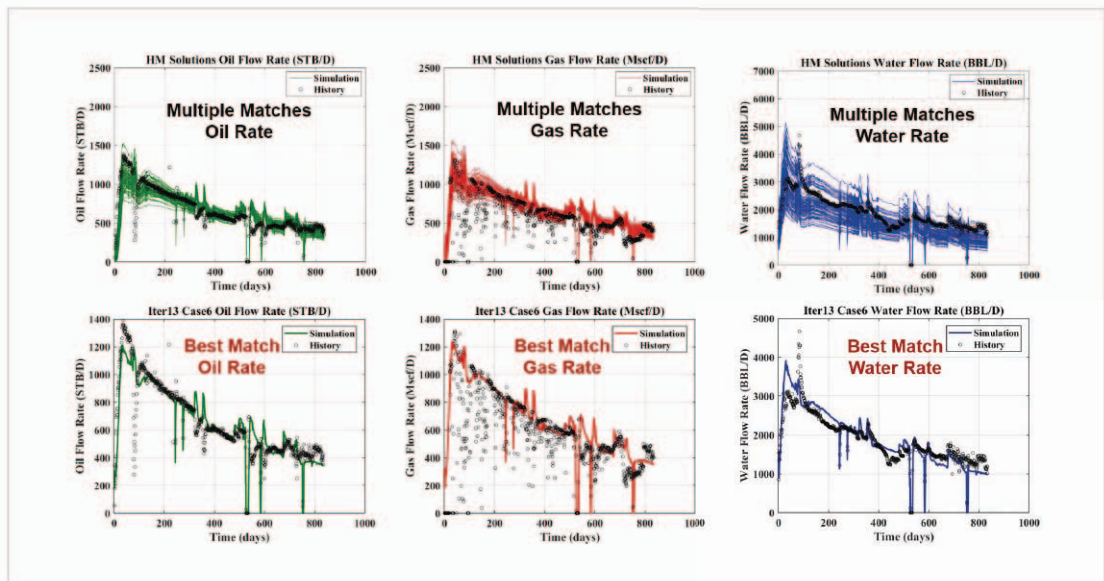
SimTech's AHM technology is now available and has been implemented in real field applications for assessing operators about future improved fracture designs and what could be happening below the ground. This figure shows a Field Application of EDFM-AI for automatic history matching in the Permian Basin with complex fractures.

Best representative realization

P (psi)
10000
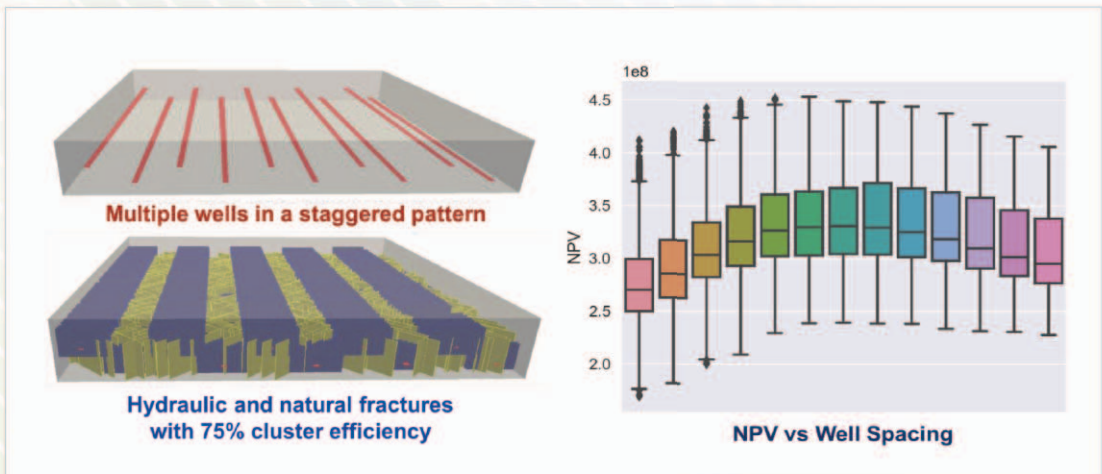7750
5500
3250
1000

10,000 ft
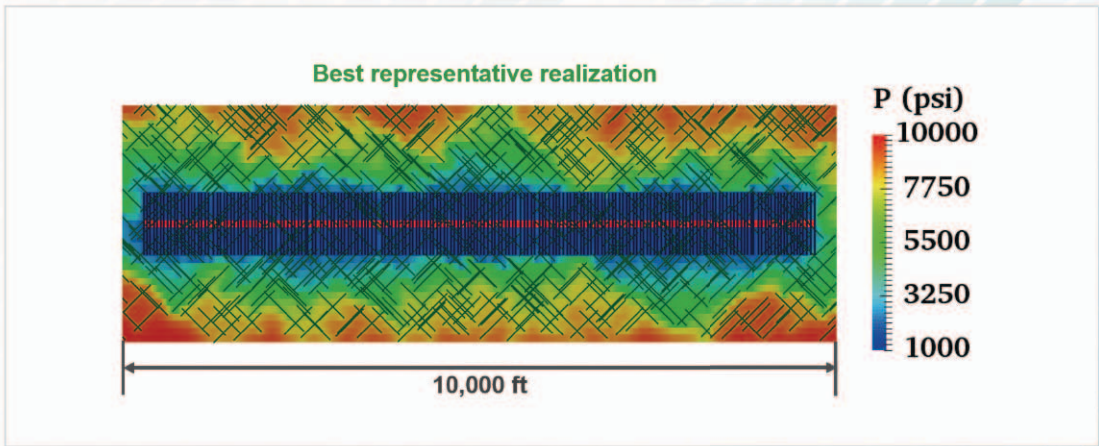
Pressure distribution visualization of the most representative solution. Areal pressure depletion at different time steps can be easily appraised with EDFM-AI.
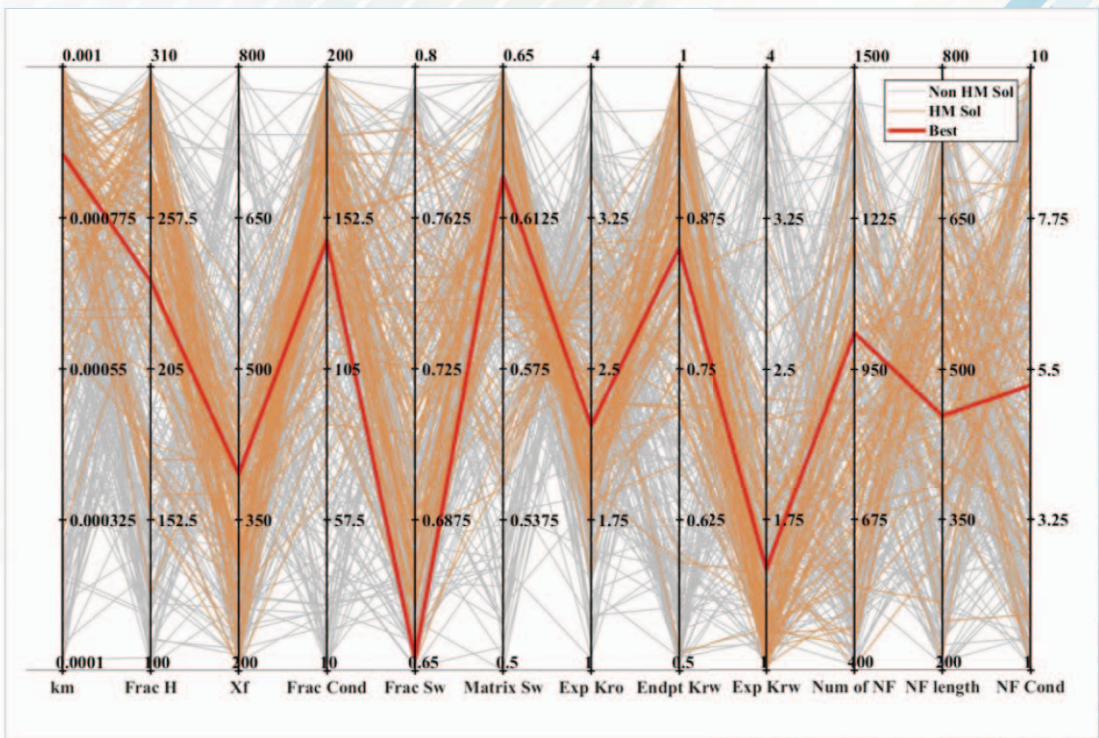
Parallel plot for multiple combinations and the best scenario. Example of all the sensitivities our AHM workflow can perform considering 15 uncertain parameters (gray), the solutions that can be found (orange), and the best unique solution (red).

Fracture half-length   Fracture height   Fracture conductivity   Relative permeability
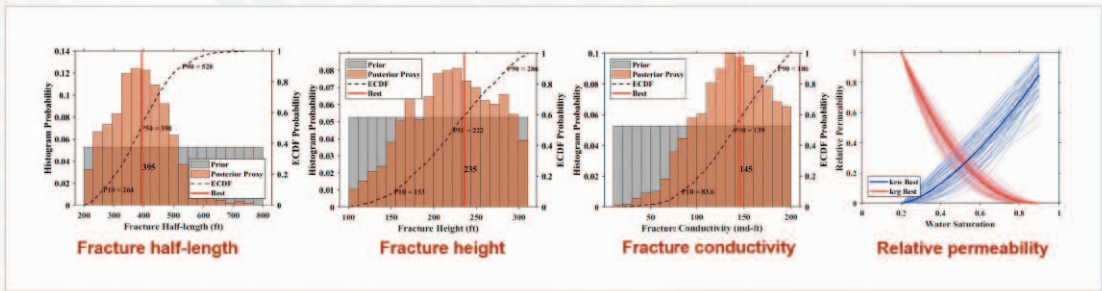
Using our powerful software, our clients will attain a better understanding of the fracture properties based on posterior statistical distribution, reducing uncertainty of these complex subsurface properties. EDFM-AI aids to the characterization of effective fracture and matrix properties for future optimized fracture designs in infill wells (e.g. Image above shows field application for Permian Basin with complex fractures)

Multiple wells in a staggered pattern

Hydraulic and natural fractures with 75% cluster efficiency

NPV vs Well Spacing

Well spacing assessment can be a valuable outcome of our fast technology. Within our EDFM-AI, NPV calculations can be evaluated with respect to optimal well spacing. (e.g. well spacing optimization in Permian Basin with complex fractures)

SimTech is open to share ideas and future projects with hundreds of professionals and academia peers, pushing boundaries of fractures and unconventional reservoirs characterization. Our efficient technology is transcending oil and gas industry, and we want you to be part of it!

SIMTECH®

25807 Westheimer Pkwy, STE 324, Katy, Texas 77494, US

www.simtechnologyus.com / info@simtechnologyus.com