

FracMan nuclear edition

Discrete fracture and hybrid DFN/EPM groundwater flow and solute transport

FracMan® Nuclear Edition provides unmatched power for hydrogeologic analysis of fractured rock. It combines the power of realistic, detailed three-dimensional (3D) discrete fracture networks with flow and transport in discrete fracture networks with integrated rock matrix interaction.



FRACTURE GEOMETRY FEATURES

- Custom discrete fracture network (DFN) models for crystalline, sedimentary, and volcanic rocks
- Spatial control of fracture intensity, orientation, and properties, including correlations to seismic attributes, geophysical logs, and structural position
- Sealing and partially sealing faults, including simulation of fault core and offsets
- Analysis of grout injection for tunnel inflow control
- Conductive fault damage zones variation of flow and transport properties at fracture intersection zones to support alternative channeling approaches
- Variability of properties within fractures and fracture zones using statistical, geostatistical, and fractal approaches
- Coupled linkage of fracture hydraulic properties to in-situ stress conditions

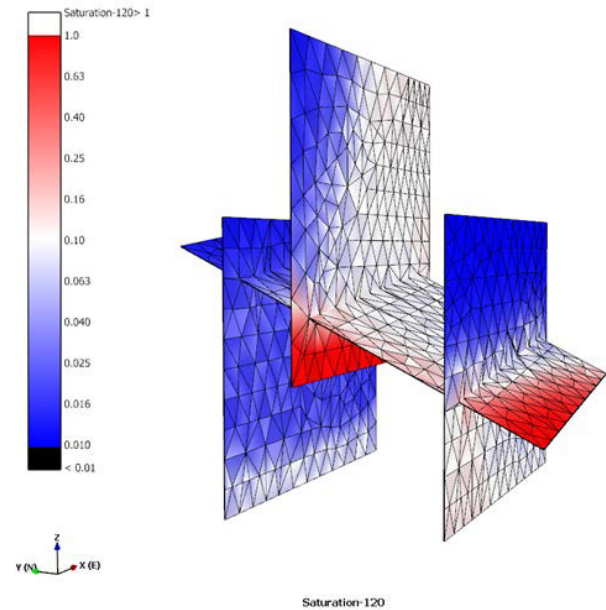
GROUNDWATER FLOW FEATURES

- Support for fracture only, fracture plus matrix storage, fracture and matrix permeability and storage, and equivalent matrix fractured rock aquifers
- Wellbore storage and skin effects
- Direct implementation of flow barrier (sealing and partially sealing) faults in the flow solution
- Available upscaling to MODFLOW, FEFLOW®, and other equivalent porous media EPM (Continuum) hydrogeologic models
- Neumann, Dirichlet and mixed boundary conditions
- Steady-state and transient solutions

- True multiple-porosity, steady-state and transient flow with networks of discrete fractures and integrated rock matrix volume elements
- Hybrid discrete fracture network modeling, and upscaling fracture networks to EPM (Continuum) elements, where possible, while maintaining fully detailed DFN networks, where detail is needed
- Support for spatially variable infiltration and moving phreatic surfaces

SOLUTE TRANSPORT FEATURES

- Particle tracking solution and graph theory solutions to identify streamlines and transport pathways through fractures and rock matrix
- Transport solution according to advection-dispersion equation
- Optional links for continuous time random walk transport equations
- Surface (K_a) and volumetric sorption (K_d), diffusion, and biodegradation
- Constant and time-varying mass rate and concentration boundary conditions
- Radionuclide decay and speciation for both particle tracking
- One-dimensional (1D), two-dimensional (2D) and 3D transport solutions, including 3D networks of 1D pipes for rapid solution of complex multi-porosity transport problems
- Graph theory analysis of transport and connectivity pathways
- Compartmentalization analysis
- Solution of heat flow and thermal boundary conditions



FRACMAN CONSULTING SERVICES

- Radioactive waste repository site characterization and performance assessment
- Groundwater flow and solute transport
- Discrete fracture network multi-phase flow modeling
- Flow test dynamic calibration
- Fractured rock analysis and characterization
- Groundwater response to earthquake
- Tunnel and slope stability
- Earthquake impact on site
- Paleo-hydrogeologic modeling of glacial and brine end members
- Radioactive waste repository licensing

ABOUT WSP

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CONTACT US

For more information about how we can help you deliver your next project, contact:

Mark Cottrell, PhD, MSc, BEng
 Technical Director
 Earth and Environment

mark.cottrell@wsp.com

T: +44 0 1628 851851

D: +44 115 937 1180

M: +44 7971 250084

wsp.com/FracMan