

DFN.lab: software platform for Discrete Fracture Network models.

Romain Le Goc, Benoît Pinier, Caroline Darcel, Etienne Lavoine, Diane Doolaeghe, Silvia de Simone, Jean-Raynald de Dreuzy, Philippe Davy

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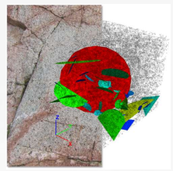
DFN.lab: software platform for Discrete Fracture Network models

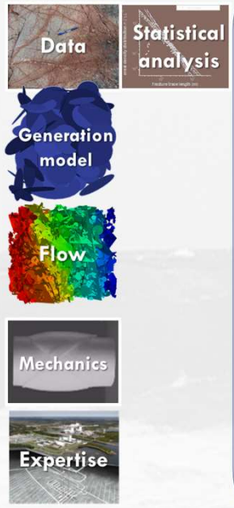
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DFN.lab is developed by the **Fractory**, a joint laboratory between Itasca France, the CNRS and the university of Rennes.

Missions: Research, Consulting R&D and teaching





Fast, efficient, state-of-the-art
High-performance core in C++
Python API
Dynamic application-oriented development
Compatible with Jupyter Notebook

Modularity
Divided in modules
Complete workflows from DFN generation to advanced simulations

Reliability
Testing, Versioning
Publications in peer-reviewed journals
Q/A for industrial applications

Publications

Pinier et al. *Computation of flow and transport properties on large heterogeneous 3D fractured media*, to be published

Lavoine et al. *A Discrete Fracture Network with stress-driven nucleation*, Frontiers in Physics, accepted.

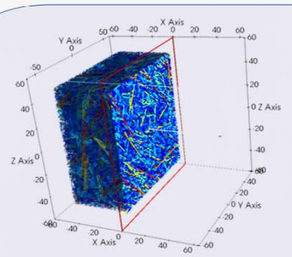
Contact

www.fractory.org
https://gitlab.com/fractorylab/dfnlab
fractory@itasca.fr

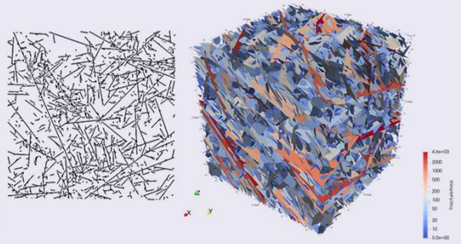
Acknowledgements

PROJET FINANCÉ PAR L'ANR - PROJECT FUNDED BY THE ANR

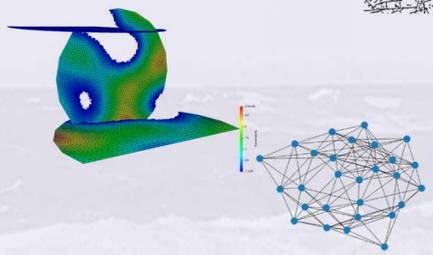
Features



Various geometries
Polyhedral systems
Planar convex fractures
1D boreholes, tunnels

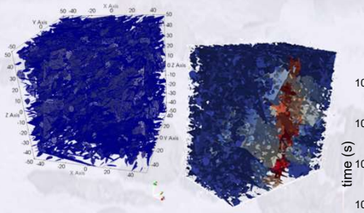


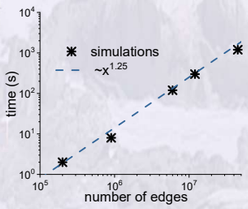
DFN generation
Statistical fractures
Genetic models based on fracture mechanics

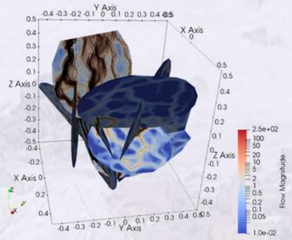


Heterogeneous properties
Sealing, transmissivities
Advanced graph algorithms
structural analyses

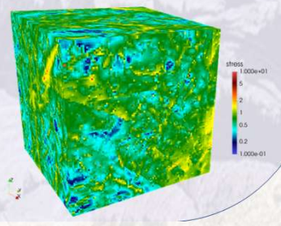
Conforming mesh
millions of fractures
Flow simulations
steady-state, transient
MHFE scheme
Efficient solution
Flexible conditions
permeameter, pumping





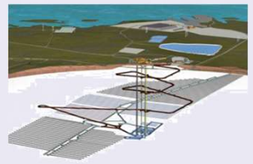


Transport in fractures
particle tracking method
millions of particles
Analyses
Breakthrough curves, channeling

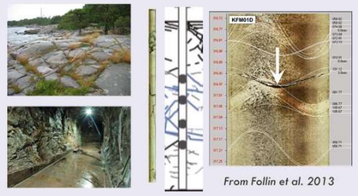


Linear elastic mechanics
Strain/Stress/displacement fields in and out of fractures
Stress intensity factors
Effective rock mass properties

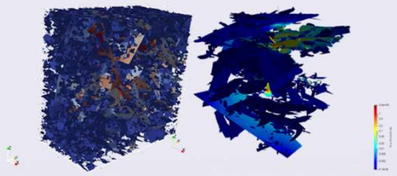
Applications



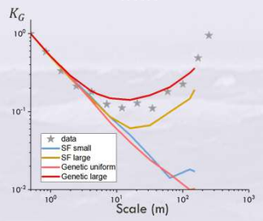
Risk assessment studies for nuclear waste repositories



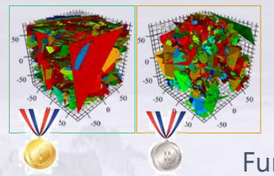
Data integration: definition of site-scale DFN models



Large scale Pumping tests with 2 order of magnitudes between l_{min} and L

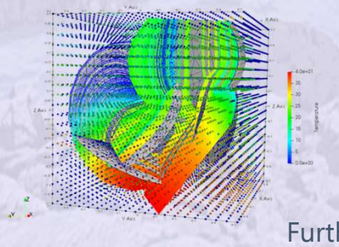


Statistical characteristics of flow: permeability and channeling



Evaluation and discrimination of models

Further details: *Davy et al.* H41H-1760

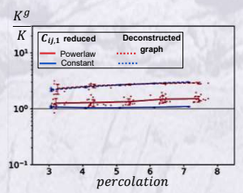


Heat transfer in fractured rocks

Heat transport in fractures with Lagrangian methods coupled with matrix diffusion.
Dynamic fractures' aperture modifications

Further details: *de Simone et al.* H41H-1786





Fast estimation of flow with graph methods

DFN transformed into graph for fast estimation of flow and transport in fractures

Further details: *Doolaeghe et al.* H34A-01