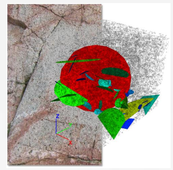
DFN.lab: software platform for Discrete Fracture Network models

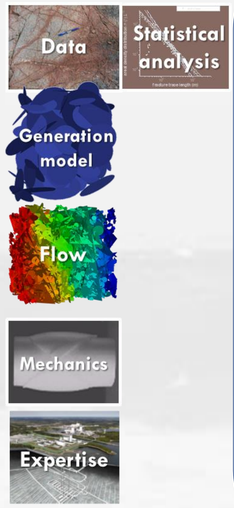
R. Le Goc[1], B. Pinier[2], C. Darcel[1], E. Lavoine [1,2], D. Doolaeghe [1,2], S. de Simone[2], Jean-Raynald de Dreuzy[2], P. Davy[2]

1 Itasca Consultants SAS, Écully, France - 2 Univ Rennes, CNRS, Géosciences Rennes, UMR 6118, 35000 Rennes, France

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

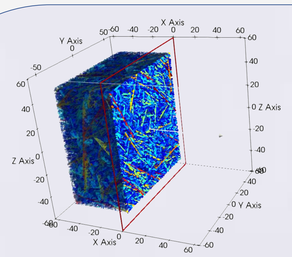
Lavoine et al. *A Discrete Fracture Network with stress-driven nucleation*, Frontiers in Physics, accepted.

Contact

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

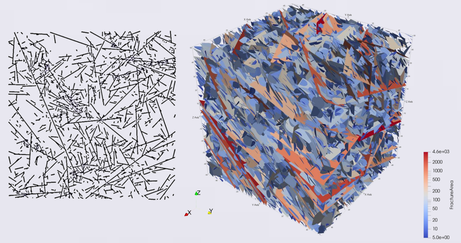
Acknowledgements

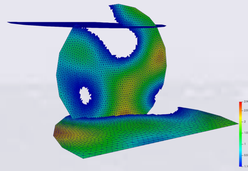
Features

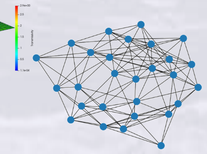


Various geometries
Polyhedral systems
Planar convex fractures
1D boreholes, tunnels

DFN generation
Statistical fractures
Genetic models based on fracture mechanics

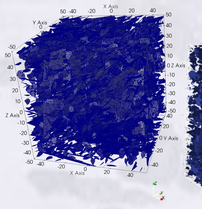


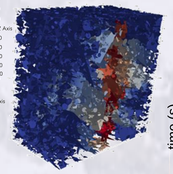


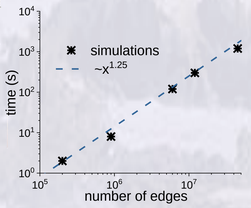


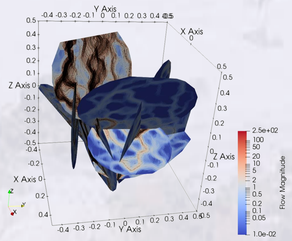
Heterogeneous properties
Sealing, transmissivities
Advanced graph algorithms
structural analyses

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

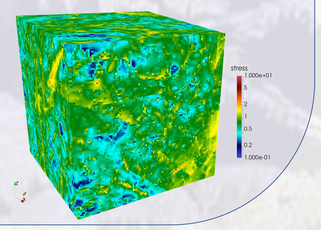






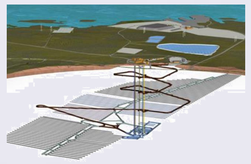


Transport in fractures
particle tracking method
millions of particles
Analyses
Breakthrough curves, channeling

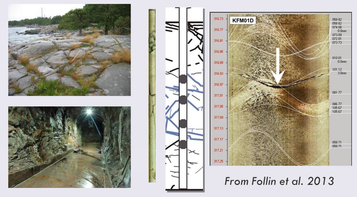


Linear elastic mechanics
Strain/Stress/displacement fields in and out of fractures
Stress intensity factors
Effective rock mass properties

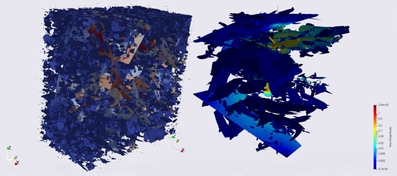
Applications



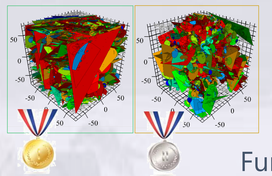
Risk assessment studies for nuclear waste repositories

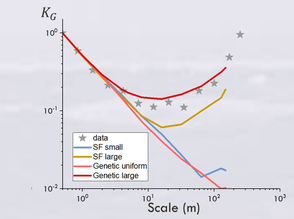


Data integration: definition of site-scale DFN models



Statistical characteristics of flow: permeability and channeling

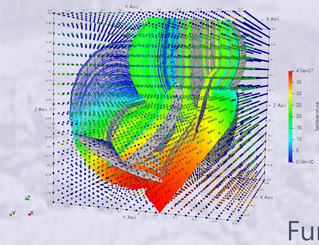




Large scale Pumping tests with 2 order of magnitudes between l_{min} and L

Evaluation and discrimination of models

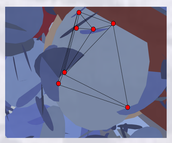
Further details: *Davy et al.* H41H-1760

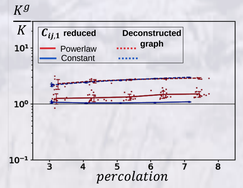


Heat transfer in fractured rocks

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