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

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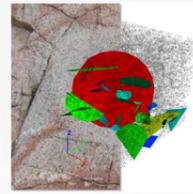
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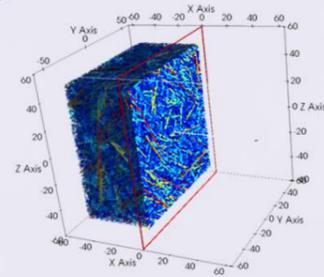
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DFN.lab is developed by the **Fractory**, a joint laboratory between Itasca France, the CNRS and the university of Rennes.

Missions: Research, Consulting R&D and teaching

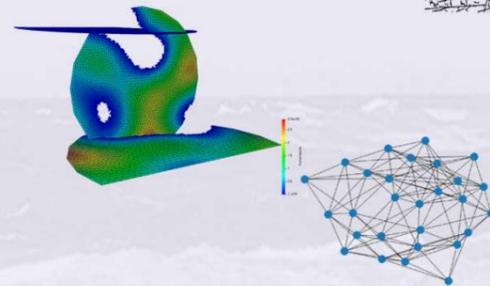
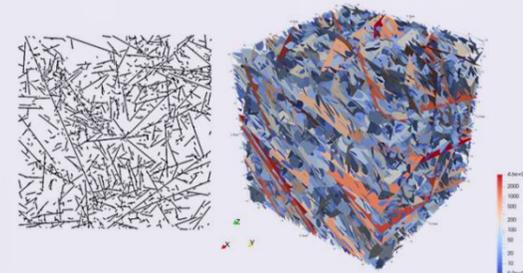


## Features



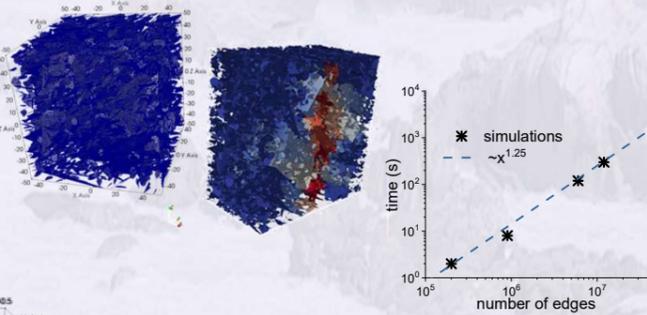
**Various geometries**  
Polyhedral systems  
Planar convex fractures  
1D boreholes, tunnels

**DFN generation**  
Statistical fractures  
Genetic models based on fracture mechanics

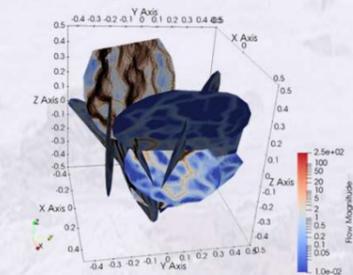


**Heterogeneous properties**  
Sealing, transmissivities  
**Advanced graph algorithms**  
structural analyses

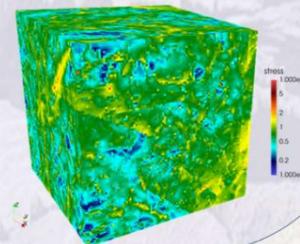
**Conforming mesh**  
millions of fractures  
**Flow simulations**  
steady-state, transient  
MHFE scheme  
Efficient solution  
**Flexible conditions**  
permeability, pumping



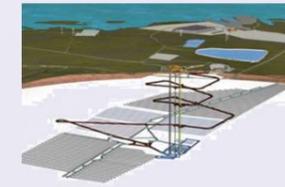
**Transport in fractures**  
particle tracking method  
millions of particles  
**Analyses**  
Breakthrough curves, channeling



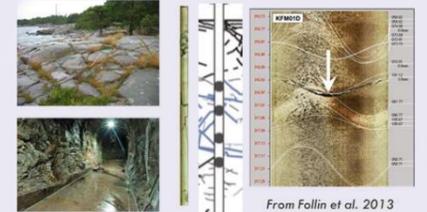
**Linear elastic mechanics**  
Strain/Stress/displacement fields in and out of fractures  
Stress intensity factors  
Effective rock mass properties



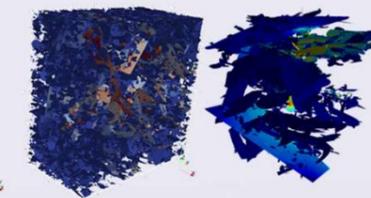
## Applications



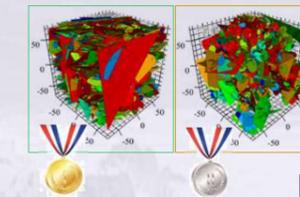
**Risk assessment studies for nuclear waste repositories**



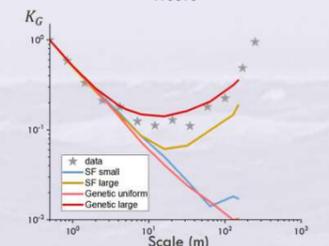
Data integration: definition of site-scale DFN models



Statistical characteristics of flow: permeability and channeling



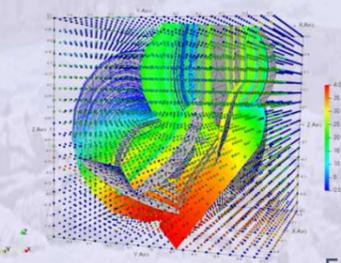
Large scale Pumping tests with 2 order of magnitudes between  $l_{min}$  and  $L$



Evaluation and discrimination of models

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

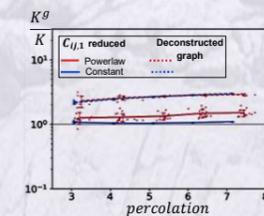
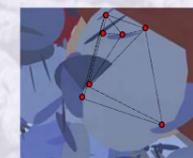
**Heat transfer in fractured rocks**



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: *Doolaege et al.* H34A-01

**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**

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