Le Goc Romain

Senior Research Engineer | Fractured Rock Hydrogeology, DFN Modeling, Scientific Software

Senior research engineer with 15+ years of experience in fractured rock hydrogeology, DFN modeling, and scientific software development. Specializes in flow, transport, and hydro-mechanical simulation for nuclear waste disposal, mining, and energy applications. Leads the development of DFN-based methods and tools, with strong expertise in C++/Python scientific computing and model-based interpretation of geological and hydraulic data.

Expertise

Fractured rock hydrogeology; discrete fracture network (DFN) modeling; numerical modeling; hydro-mechanical analysis; geomechanics; inverse modeling; scientific computing; software design and development; Python; C++.

Education

PhD in Earth Sciences (hydrogeology),
University of Rennes, France, 2010
Hydrogeological modeling of fractured rock environments

Engineering degree in computer science (Master's degree),
INSA Rennes, France, 2005
Scientific computing and software engineering

Professional Experience

2018 – Present

Fractory, Itasca Consultants S.A.S., Rennes, France
Senior Research Engineer

- Lead the development of DFN methodologies and software tools for fractured rock characterization and simulation.
- Deliver hydrogeological and hydro-mechanical studies for nuclear waste disposal, mining, and energy applications.
- Develop and maintain DFN.lab capabilities for 3D fracture network generation, flow, transport, and mechanical analysis.
- Integrate geological, borehole, tunnel mapping, and hydraulic data into site-scale DFN workflows.
- Support project delivery, technical innovation, and collaboration with industrial and academic partners.

2010 – 2018

Itasca Consultants S.A.S., Ecully, France
Research Engineer

- Conducted DFN modeling studies for mining projects and deep geological repository programs.
- Developed numerical workflows for fractured rock characterization, uncertainty analysis, and hydraulic simulation.

- Contributed to software development and applied modeling for large research and industrial projects.

2007 – 2009	*Itasca Consultants S.A.S., Ecully, France & Géosciences Rennes, University of Rennes* *PhD candidate*
2005 – 2006	*Géosciences Rennes, University of Rennes, France* *Research assistant*

Selected Project Experience

Deep Geological Repositories for Nuclear Waste
- Performed DFN modeling for site characterization, hydraulic behavior, and safety assessment in crystalline rock settings.
- Contributed to projects in Forsmark, Olkiluoto, and Canada using borehole and tunnel mapping data.

Mining Applications
- Applied DFN methods to assess the hydraulic and mechanical properties of rock masses in mass mining projects.
- Led geological and structural data analysis for predictive modeling in Kiruna, Sweden.

Rock Mechanics and PFC3D
- Simulated fragmentation and stress-driven rock mass behavior using PFC3D.
- Analyzed fracture interaction mechanisms relevant to rock mass response.

DFN.lab Development
- Led development of DFN.lab, a software platform for 3D DFN modeling in hydrogeology and geomechanics.
- Implemented modules for network generation, flow and transport simulation, and mechanical analysis through high-performance C++ components and a Python API.
- Developed inverse approaches to identify dominant flow paths from hydraulic data.

Programming and Software
C++, Python, DFN.lab, PFC3D, 3DEC, scientific computing, numerical methods, software design and implementation