Hafssa Tounsi – ITASCA Minneapolis

Geomechanics Engineer

Expertise

Thermo-Hydro-Mechanical-Chemical (THMC) Coupling, Computational Geosciences, Rock Mechanics

Education

Ph.D. (Geosciences and Geoengineering), 2019
Mines Paris-PSL, Paris, France

M.Sc. (Rock and Soil Mechanics), 2015
Ecole des ponts ParisTech, Champs-sur-Marne, France

B.Eng. (Civil Engineering), 2014
Hassania School of Public Works, Casablanca, Morocco

Professional Affiliations

Member: American Rock Mechanics Association (ARMA), American Geophysical Union (AGU), International Society for Rock Mechanics (ISRM)

Honors

Spot award, Volunteer LEAD for the success of CouFrac 2022, Berkeley Lab (2022)

Pierre Londe Ph.D. prize, French Society of Rock Mechanics (2020)

Professional Experience

2024 – Present	ITASCA Minneapolis Geomechanics Engineer
2020 – 2024	Lawrence Berkeley National Lab, Energy Geosciences Division, Berkeley, CA Postdoctoral Scholar

Project Experience

Leach Stockpile Stability: Developed three-dimensional stockpile models and conducted seepage analyses of leachate to determine pore pressure conditions inside the stockpile. Performed stability analyses and calculated factors of safety using strength reduction methods.

Enhanced Geothermal Systems (EGS): Modeled reservoir stimulation at Utah FORGE, a U.S. DOE-sponsored underground field laboratory for advancing EGS technologies. Simulated hydraulic fracturing in naturally fractured reservoirs using the lattice-based code XSite, focusing on the interaction between hydraulic fractures and pre-existing fracture networks.

Numerical Modeling of Coupled THMC processes in the subsurface: Developed numerical models using finite element code (COMSOL) to simulate the geomechanical consequences of artificial ground freezing on exploitation tunnels located in non-frozen rock in the mine of Cigar Lake, Canada. Developed numerical models using sequential code TOUGH-FLAC to simulate the short- and long-term behavior of a generic salt repository for high-level radioactive waste, over 10,000 years, using state-of-the-art constitutive models of rock salt and crushed salt. Conducted coupled HM simulations of fault reactivation due to CO_2 sequestration using TOUGH-FLAC simulator.

Laboratory and Field Experimentation: Contributed in setting up an experimental facility for triaxial compression tests under controlled temperature, including sub-zero temperatures, and strain rate conditions. Designed and performed extensive laboratory experiments to characterize the mechanical behavior of frozen Metapelite specimens from the mine of Cigar Lake. Designed and performed stress-free freezing-thawing laboratory tests, carried out on limestone specimens initially fully saturated with sodium chloride solutions at various concentrations.

Numerical code development: Extended the TOUGH3-FLAC7 simulator capabilities to include water/ice phase change in a porous medium. Performed a geomechanical investigation of a novel idea on building geo-cooling using subsurface ice-based thermal energy storage.

Numerical code validation: Demonstrated the applicability and capabilities of coupled THM models through analytical solutions, and lab and field experiments, for instance, the Brine Availability Test in Salt (BATS) at the Waste Isolation Power Plant in New Mexico.