UNCERTAINTY QUANTIFICATION IN THREE DIMENSIONAL FLOW, TRANSPORT AND GEOMECHANICAL SIMULATIONS IN DISCRETE FRACTURE NETWORK

Ilya Lomov, LLNL, 925-422-0565, lomov1@llnl.gov

1. Ilya Lomov, LLNL
2. Souheil Ezzedine, LLNL
3. Fredric Ryerson, LLNL
4. Lee Glascoe, LLNL

Fractures and fracture networks are the principle pathways for migration of water, heat and mass in enhanced geothermal systems, oil and gas reservoirs, CO2 leakage from saline aquifers, and radioactive and toxic industrial wastes from underground storage repositories. A major issue to overcome when characterizing a fractured reservoir is that of data limitation due to accessibility and affordability. Moreover, the ability to map discontinuities in the rock with available geological and geophysical tools tends to decrease particularly as the scale of the discontinuity goes down. Data collected are often reduced to probability distribution functions for predictive modeling and simulation in a stochastic framework such as stochastic discrete fracture network. Stochastic discrete fracture network models enable probabilistic assessment of flow, transport and geomechanical phenomena that are not adequately captured using continuum models. Despite the fundamental uncertainties inherited within the probabilistic reduction of the sparse data collected, very little work has been conducted on quantifying uncertainty on the reduced probabilistic distribution functions. In the current study, we investigate the impact of parameter uncertainties of the distribution functions that characterize discrete fracture networks on the flow, heat and mass transport and geomechanics. Numerical results of first, second and third moments, normalized to a b ase case scenario, are presented and compared to theoretical results extended from percolation theory. (Prepared by LLNL under Contract DE-AC52-07NA27344)