Used Fuel Disposition Campaign

Modeling Flow in the Bentonite Rock Interaction Experiment (BRIE)

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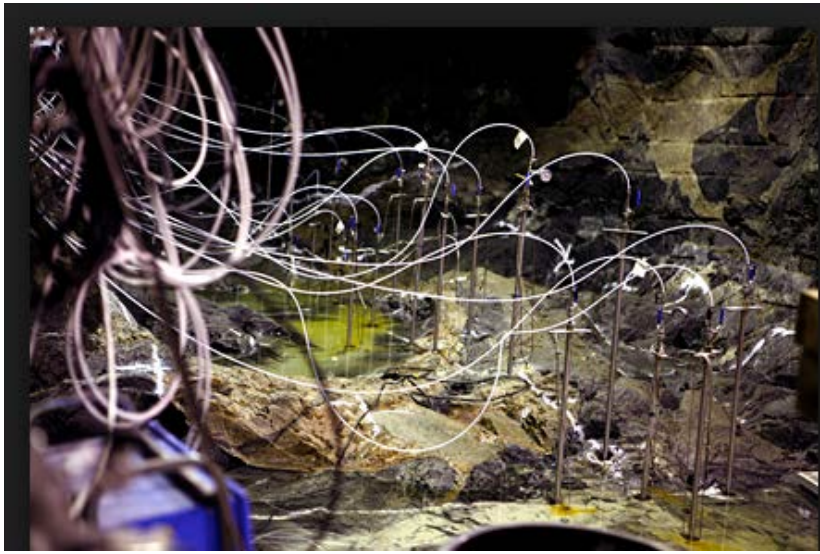
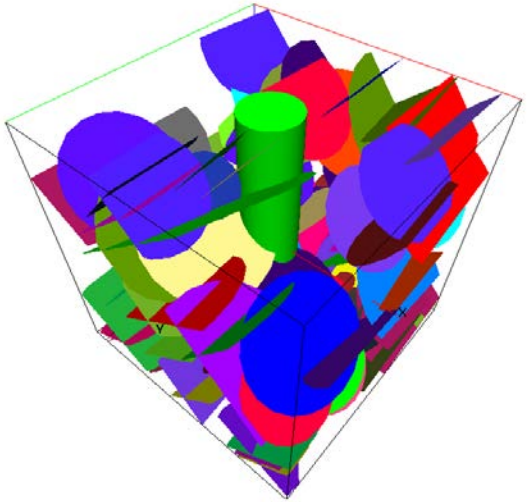
Modeling the Bentonite Rock Interaction Experiment (BRIE)

- **Joint exercise between SKB's Task Force on Groundwater Modeling and Task Force on Engineered Barrier Systems**
- **Experiment is monitoring the rewetting of bentonite in two boreholes in the bottom of an Aspo tunnel**
- **Task Forces are modeling the experiment**
- **Experiment and modeling of the experiment are intended to lead to**
  - Better scientific understanding of the exchange of water across bentonite-rock interface
  - Better predictions of wetting of bentonite buffers
- **Task force involves teams from several countries**
- **UFDC Natural Systems Evaluation task to model the experiment**
  - Test of DFN modeling capability
  - Possible collaboration with Stockholm University
  - Capability to merge DFN and volume grids under development

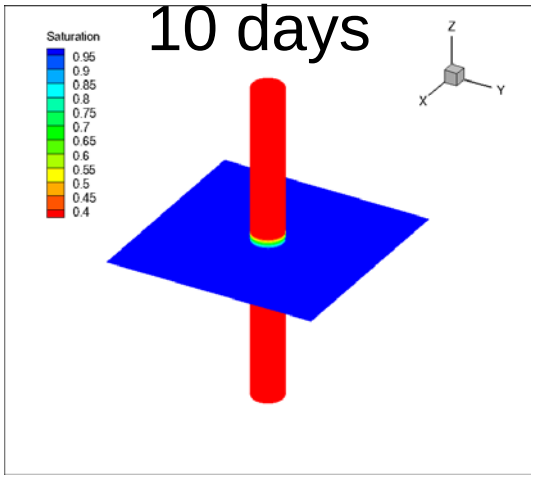


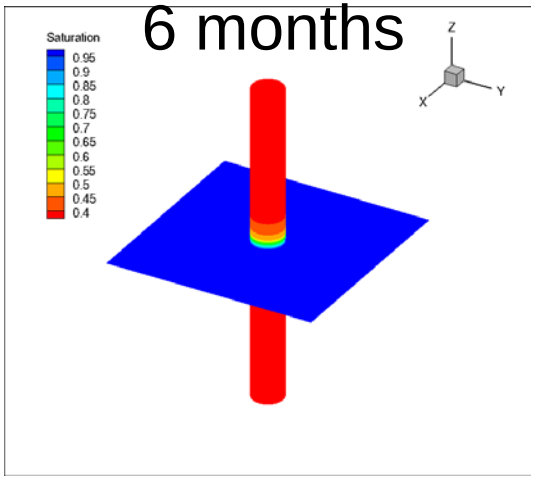


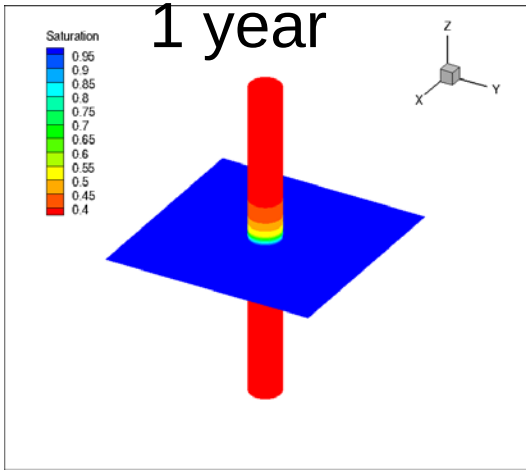
Approach to modeling the BRIE

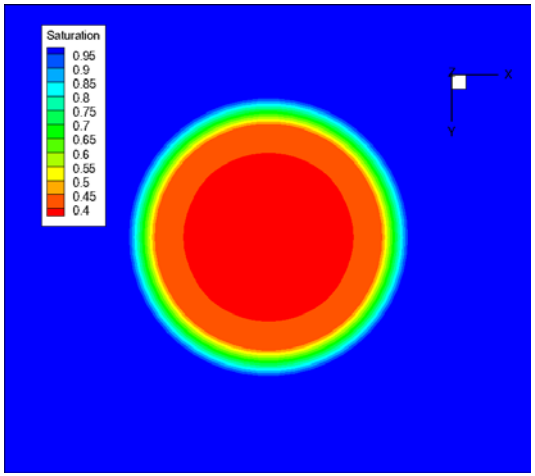
- Generate DFN inside cubic modeling domain. Include deterministic fractures. Ignore tunnels and boreholes
- Excavate mesh inside bentonite.
- Generate tetrahedral mesh inside bentonite.
- Merge the DFN and volume meshes.
- Tag DFN nodes inside tunnels and assign all atmospheric pressure
- Assign BCs and solve.

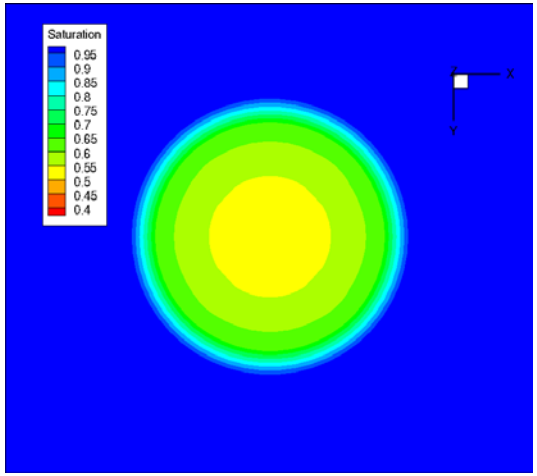
Scoping calculations

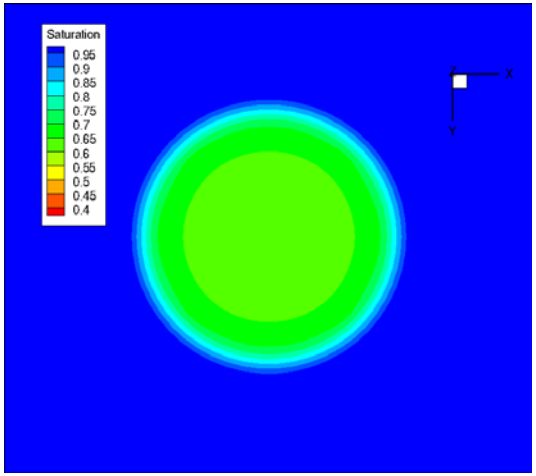






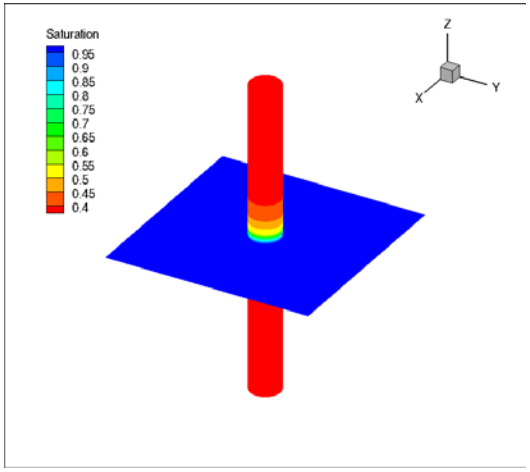


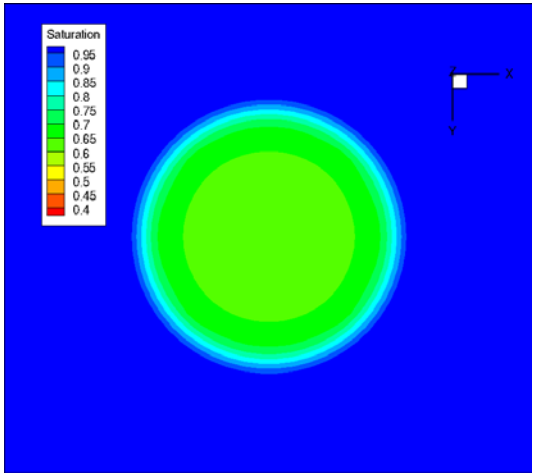




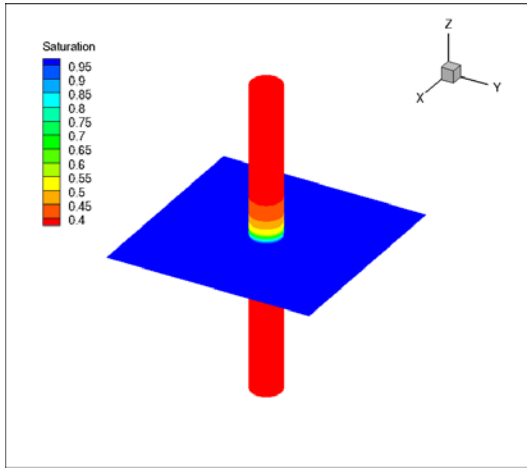
Scoping calculations

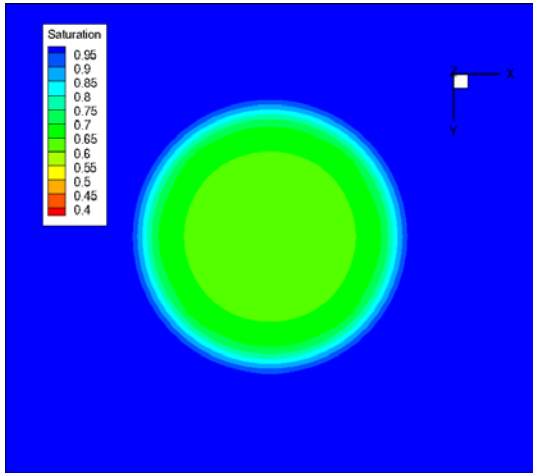
Richards Equation



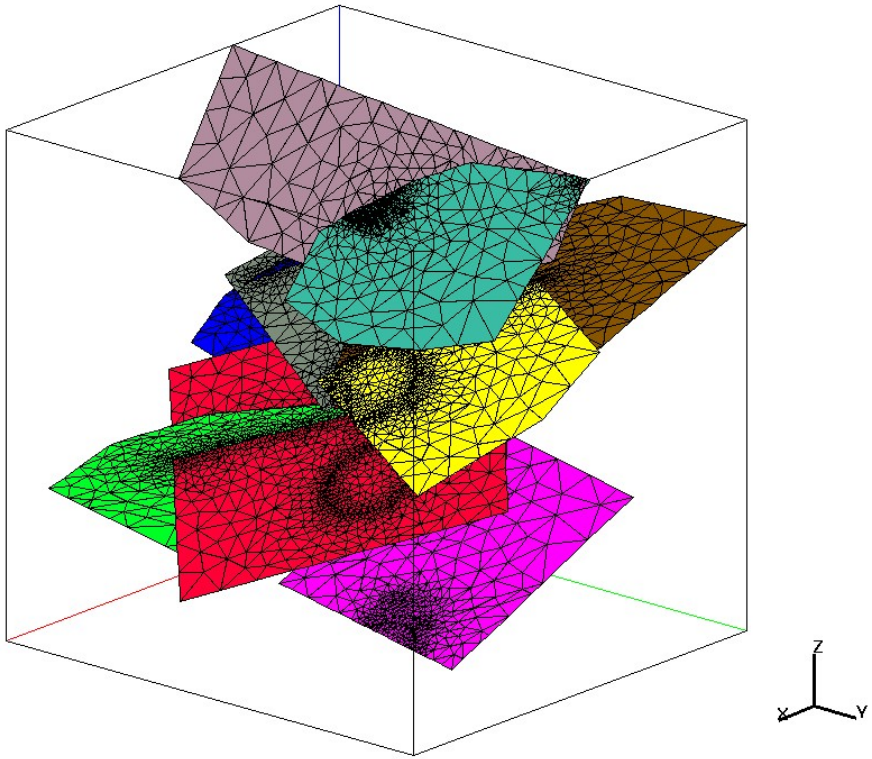


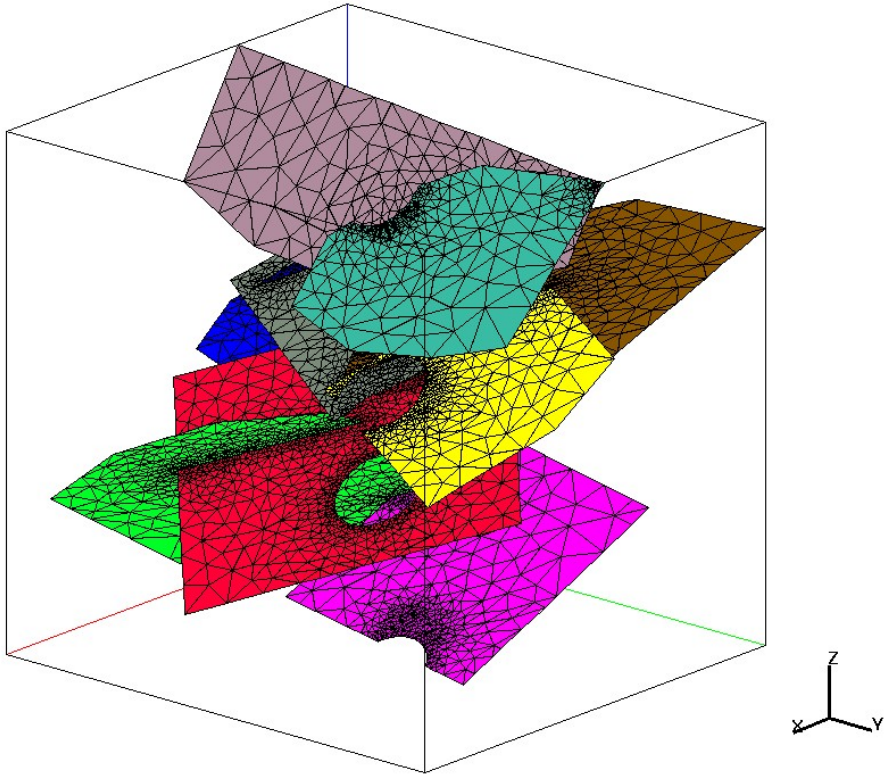
Air-water, isothermal





Nodes are placed at the intersection between fractures and the volume to be meshed. The DFN is meshed by conforming Delaunay triangulation.





Fracture nodes inside the volume are removed

Merging DFN and volume meshes

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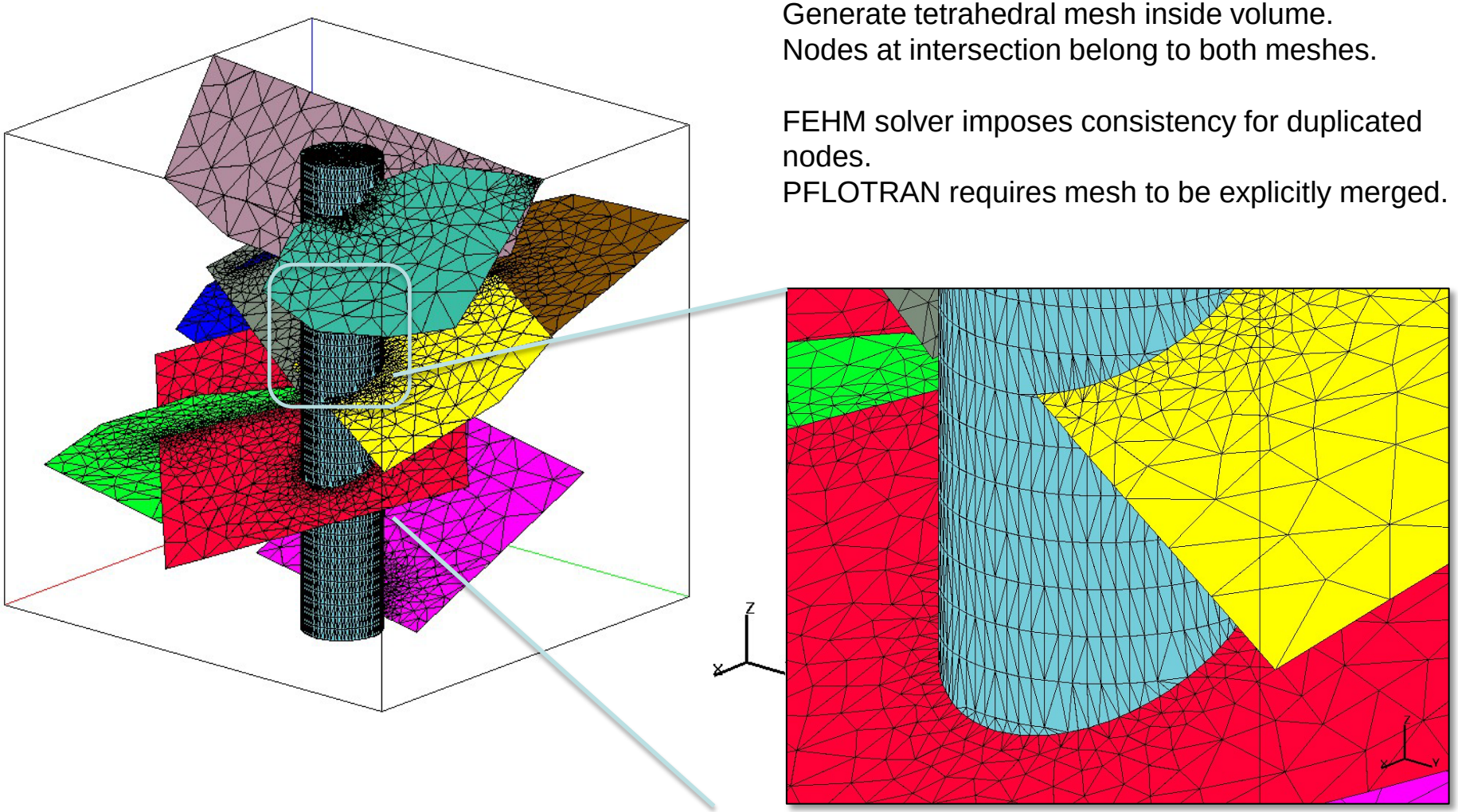
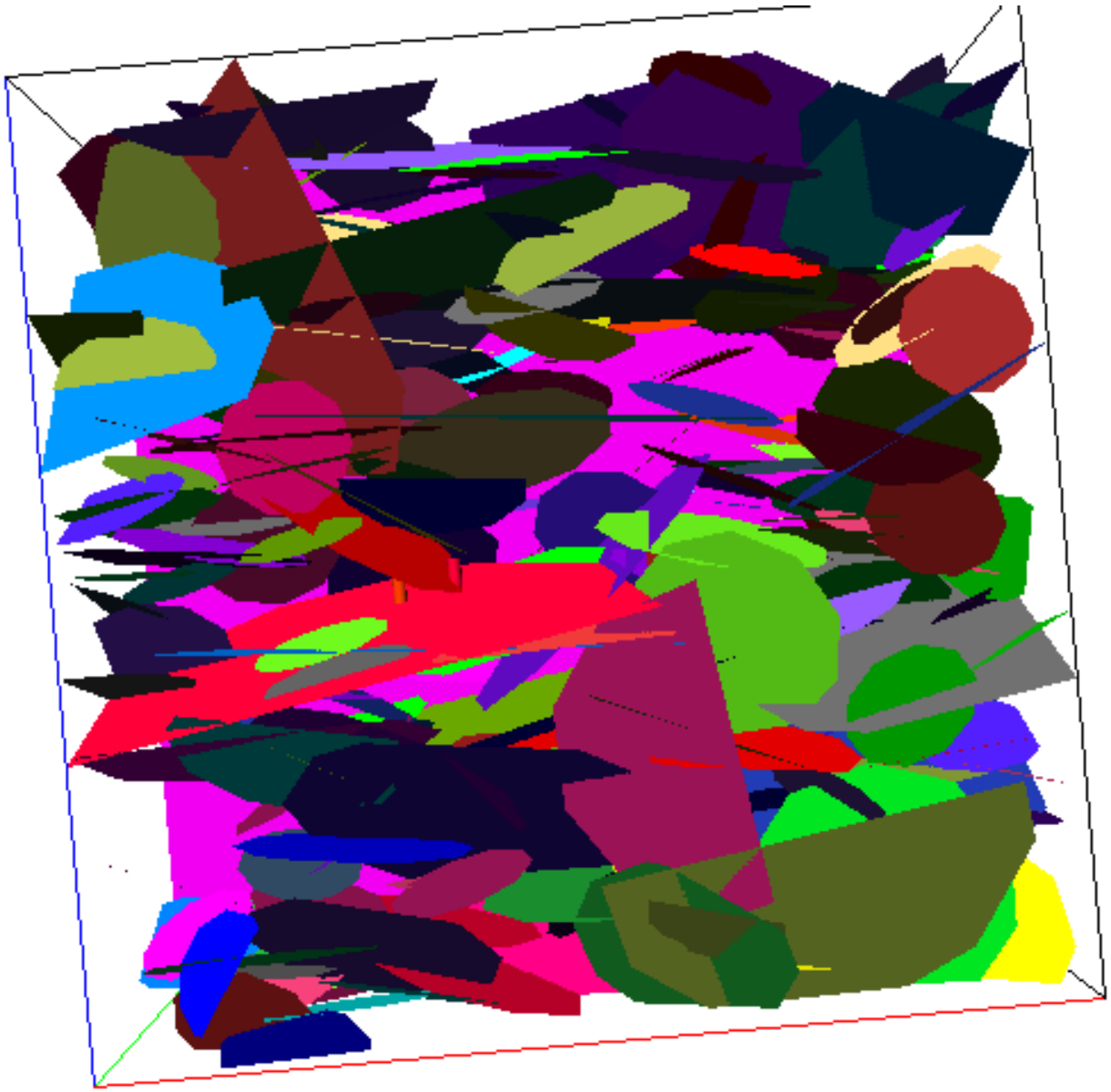


Generate tetrahedral mesh inside volume.
Nodes at intersection belong to both meshes.

FEHM solver imposes consistency for duplicated nodes.
PFLOTRAN requires mesh to be explicitly merged.

Used Fuel Disposition



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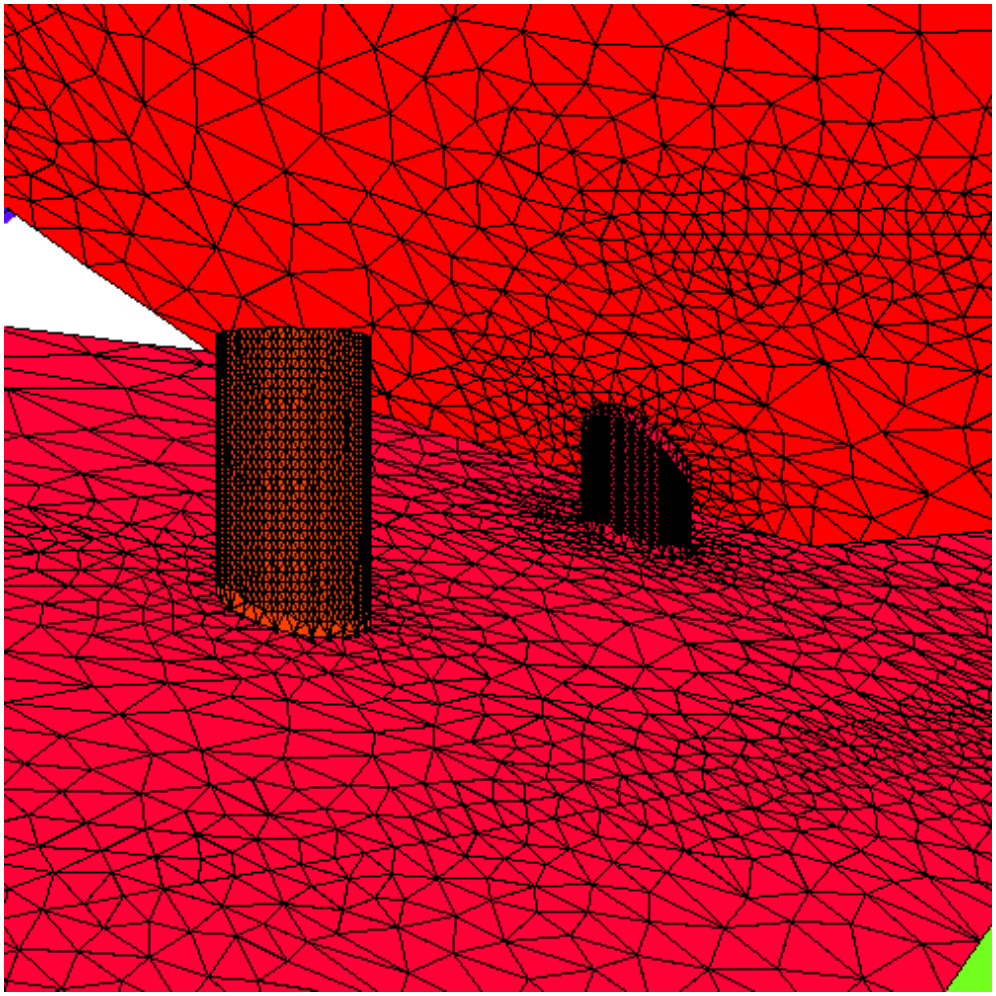
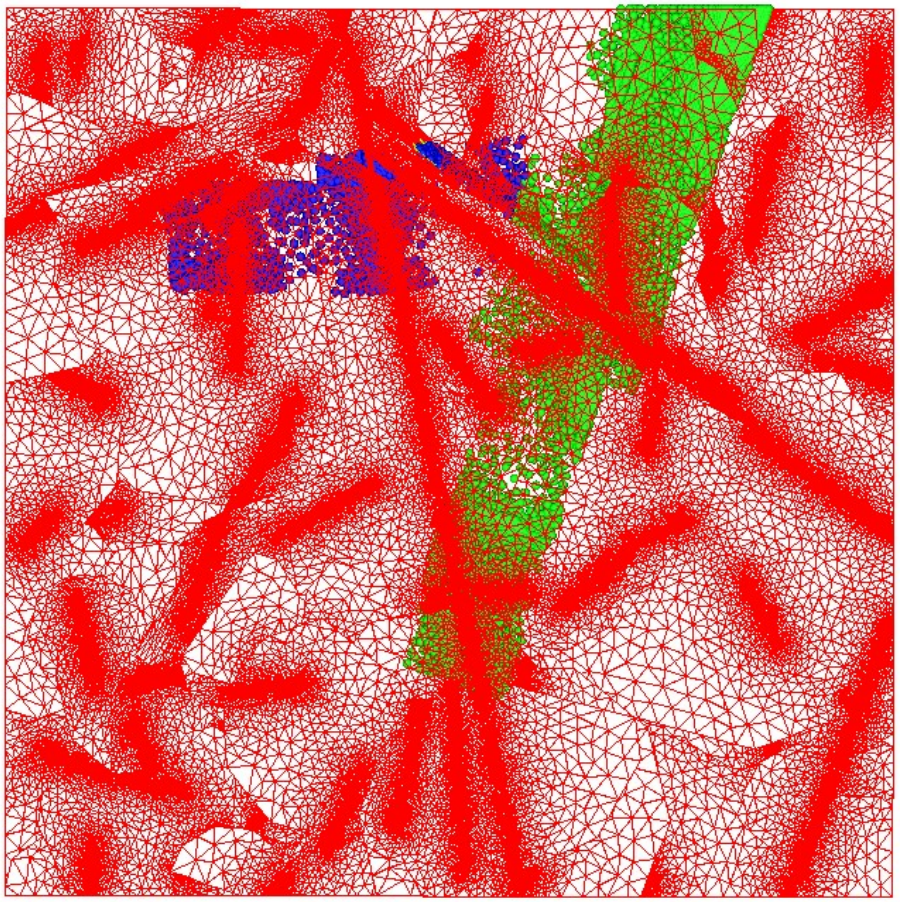


Tunnel nodes identified



Status

- **Merging of DFN and volume meshes has been demonstrated**
- **Scoping calculations with single fracture are complete**
  - Little difference between Richards formulation and two-component formulation
  - Sensitivity to bentonite properties
  - Some sensitivity to gap between clay and rock
- **3-D model with boundary conditions nearing completion**