DEC 2023

TRACKS OVERVIEW

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TRACKS

TRACK #1 – Flow in fractured media

EDFM/CEDFM/PEDFM
Comparison of the techniques.
Seems a good starting point for learning the code, getting something published, and moving forward.

TRACK #2 – Fracture propagation

Long-term thermo-hydraulic fracture propagation without predefined fracture track
Can EDFM be extended to fracture propagation?
Check SBFEM

TRACK #3 – Salt rock mechanics

THM modeling of salt geomechanics (elasticity, plasticity, creep)
Apply to fracture containment, caverns, drilling, well abandonment, etc

TRACK #4 – Homogenization of mechanical parameters

Wrap up of the results and publish
Need some thorough validation, comparison analytical results and to expand to other parameters.
Writing paper with Prof Espinoza

TRACK #5 – Computational performance

Computational and mathematics improvement for overall simulation performance.
Codesign and building applications for specific architectures are something
I've been willing to work on for a long time.

TRACK #6 – Multiscale data assimilation

Lab-to-field scale modeling, digital rocks, relative permeability, fingering etc
Translating capillary pressure to relative permeability
Interface between models in different scales

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RESEARCH PLAN AND BRAINSTORMING

notes and remarks

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Fractures

Salt geomechanics

Numerics and speedup

Multiphase flow and multiscale data assimilation

Flow/heat

- EDFM
- CEDFM – Conforming discrete fracture model
- pEDFM – projection based embedded discrete fracture model

Mechanics

- Elastic
- Homogeneization – mech model for fractured media
  - Upscaling of biot, skempton, shear modulus etc
- Plasticity
- Thermal fracture nucleation near wellbore

Physiscs: creep, fracture, stress relaxation, long term conformation (geologic time)

Large strains model

Risk assessment

- Analyze worst case scenarios, use of safety coefficients

Mechanic dynamic of salt targetting process optimization

- Uncertainty analysis to support design decisions
- Fractures, deviatoric strain relaxation

Specific applications – case study

- Salt caverns
- Salt as a caprock

Multiphase flow and multiscale data assimilation

Multiphase pore scale simulation

Numerical simulation of intermediate scales

Models and parameters tying the different scales

Assimilation of laboratory data

Guidance of the laboratory practice