Comparison of Artificial Fracture Test Results and Other Matters

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B+Tech Oy

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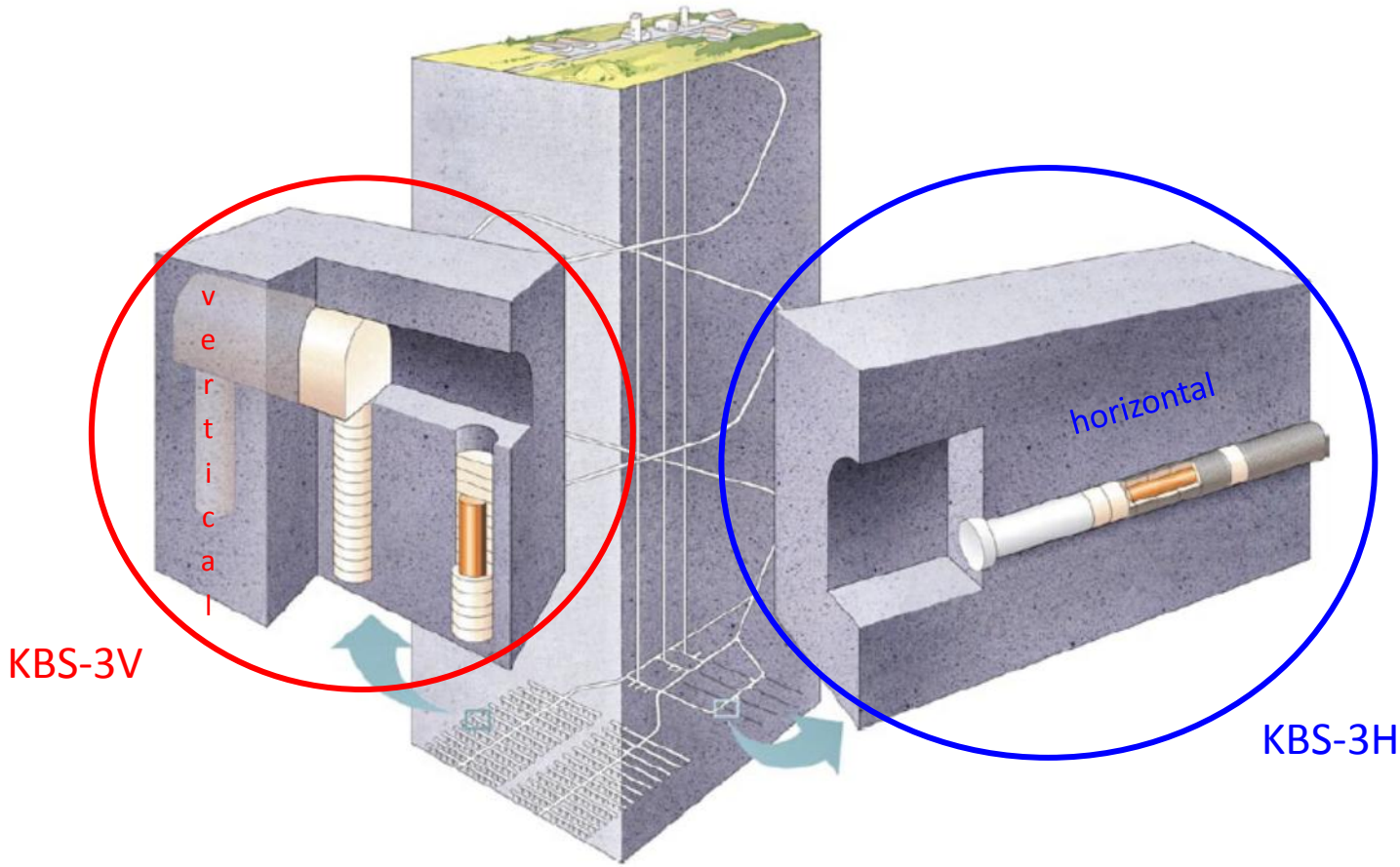
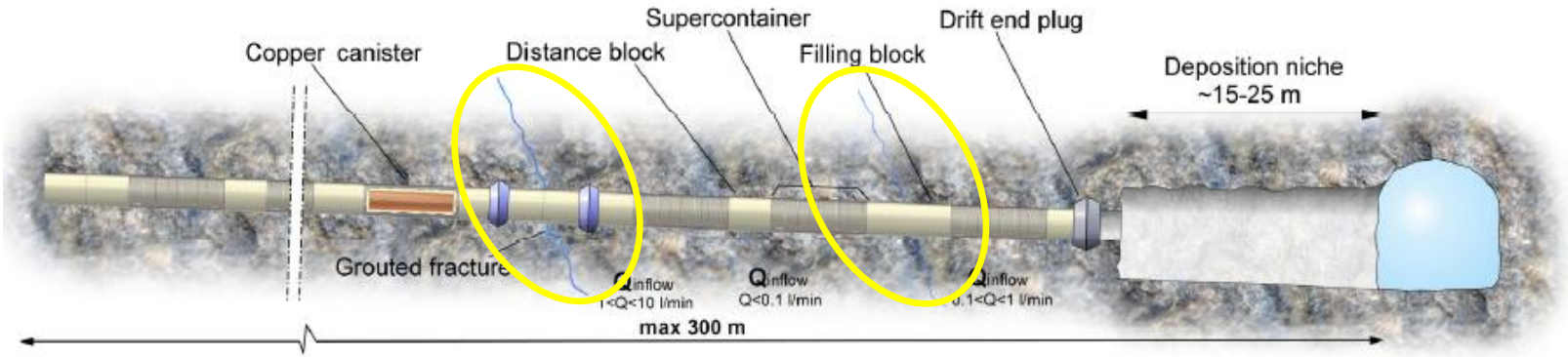
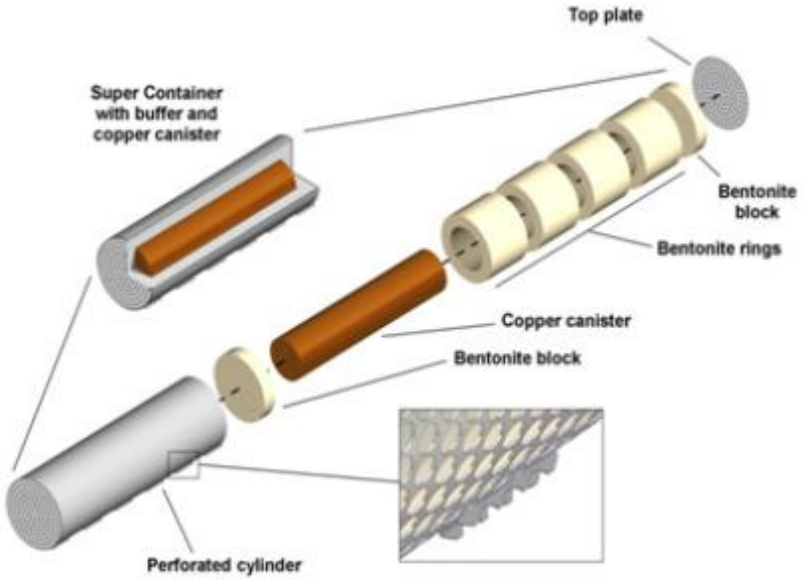
KBS-3 Design Alternatives

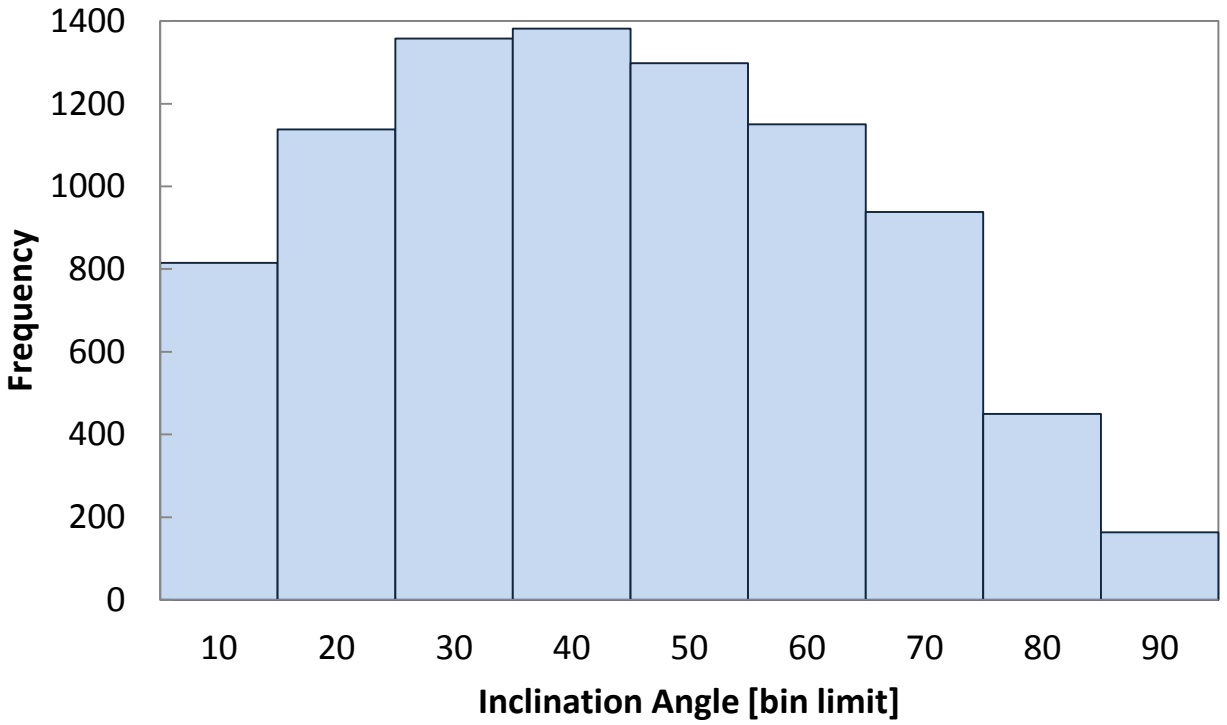


KBS-3H


Copper canister
Distance block
Supercontainer
Filling block
Drift end plug
Deposition niche
~15-25 m
Grouted fracture
Q_{inflow}
1<Q<10 l/min
Q_{inflow}
Q<0.1 l/min
Q_{inflow}
0.1<Q<1 l/min
max 300 m

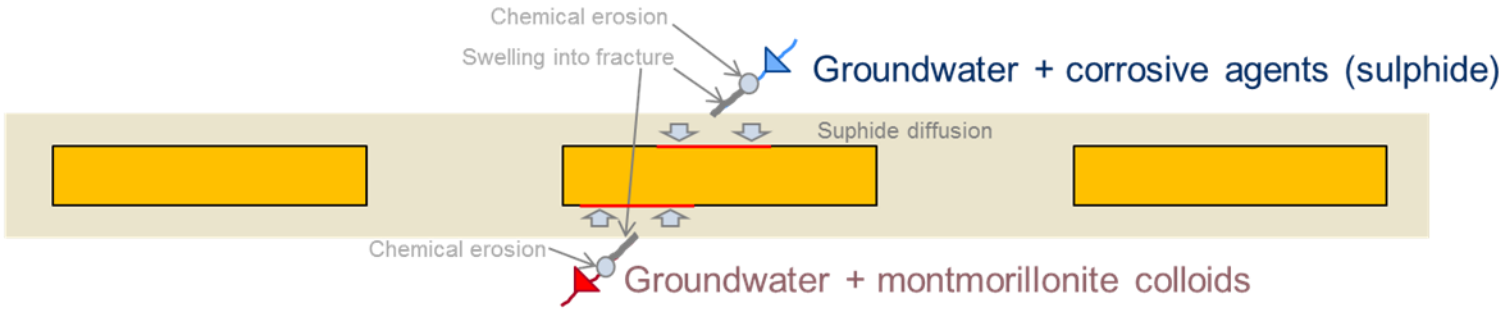

Top plate
Super Container
with buffer and
copper canister
Bentonite
block
Bentonite rings
Copper canister
Bentonite block
Perforated cylinder

Fracture Inclinations

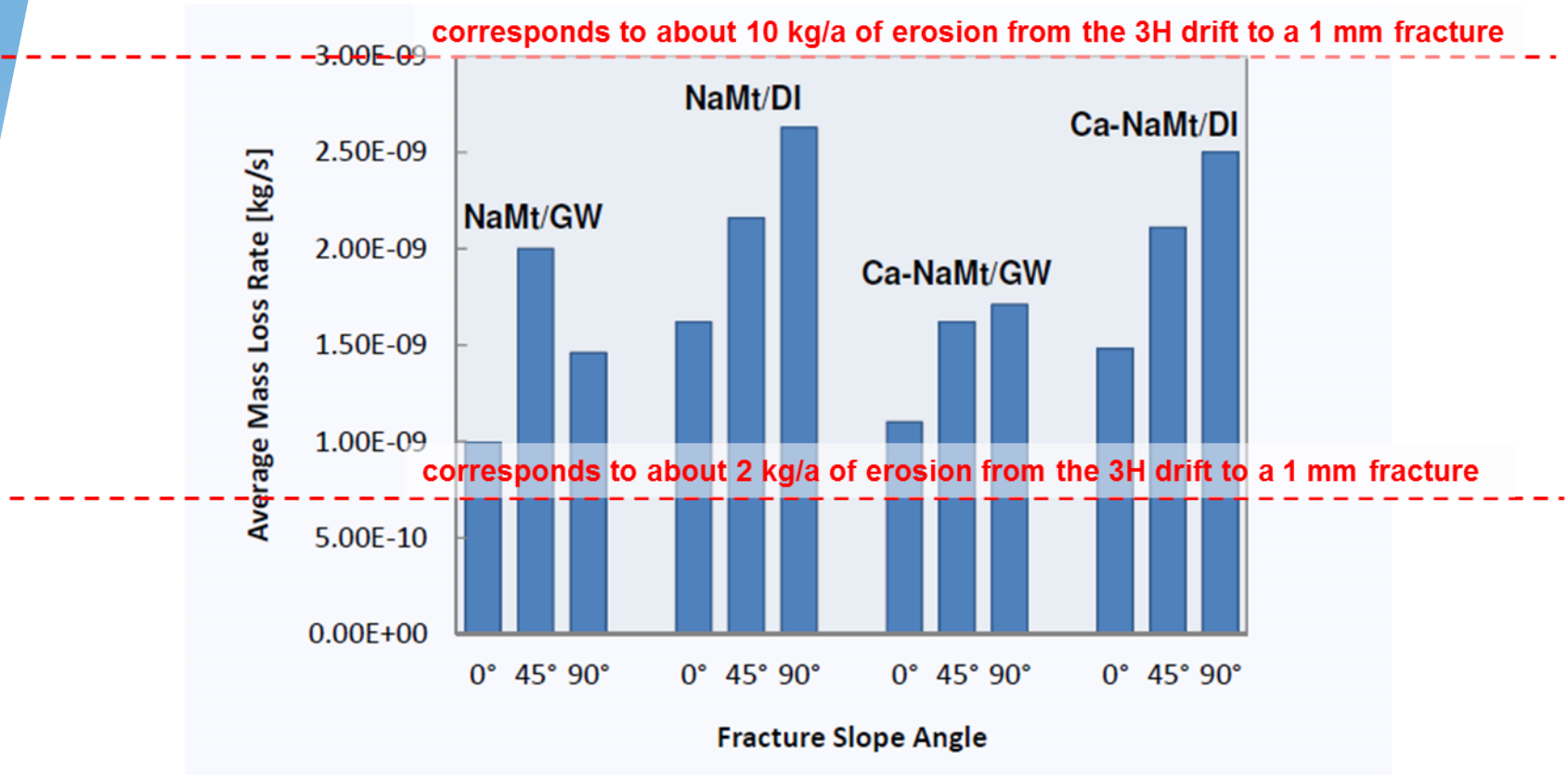


- Single realization for Olkiluoto site; N=8692
- Drifts are most frequently intersected by fractures with inclinations from 30° to 60°.

Domino Effect

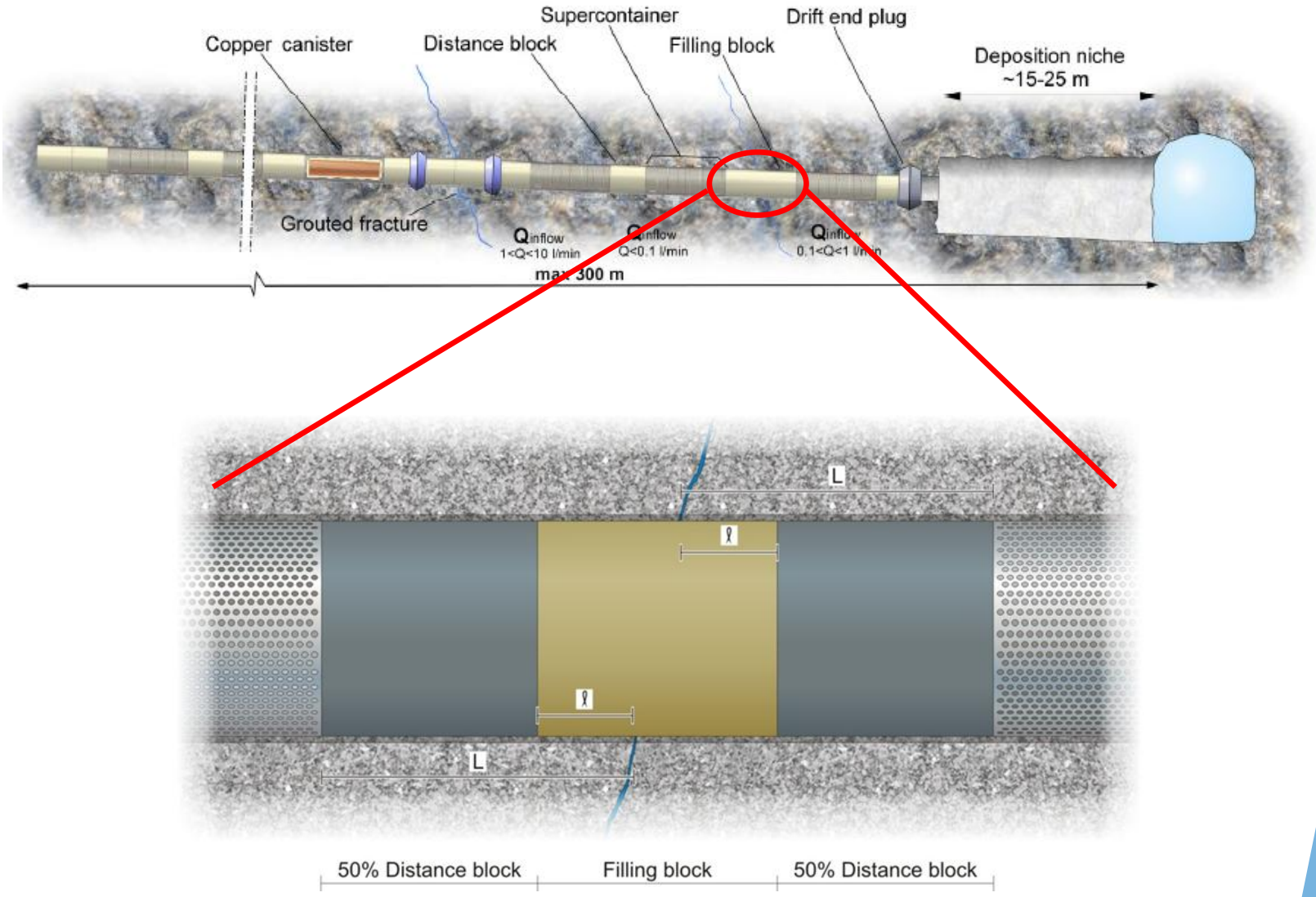


Scaled Results

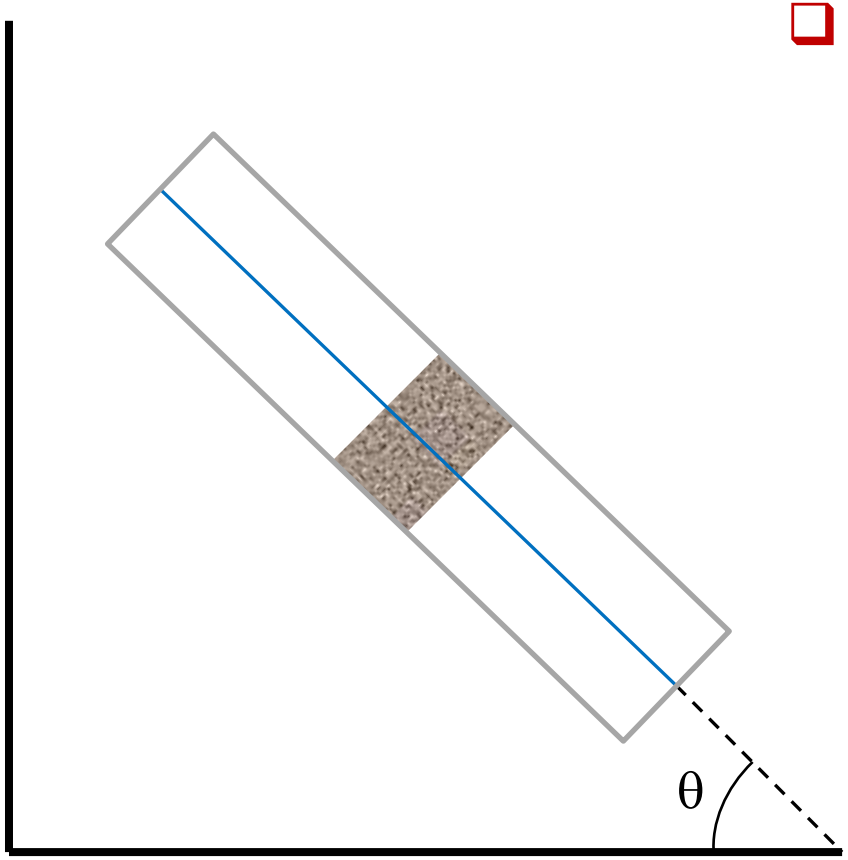


Scaling needs to be verified!

Filling Block

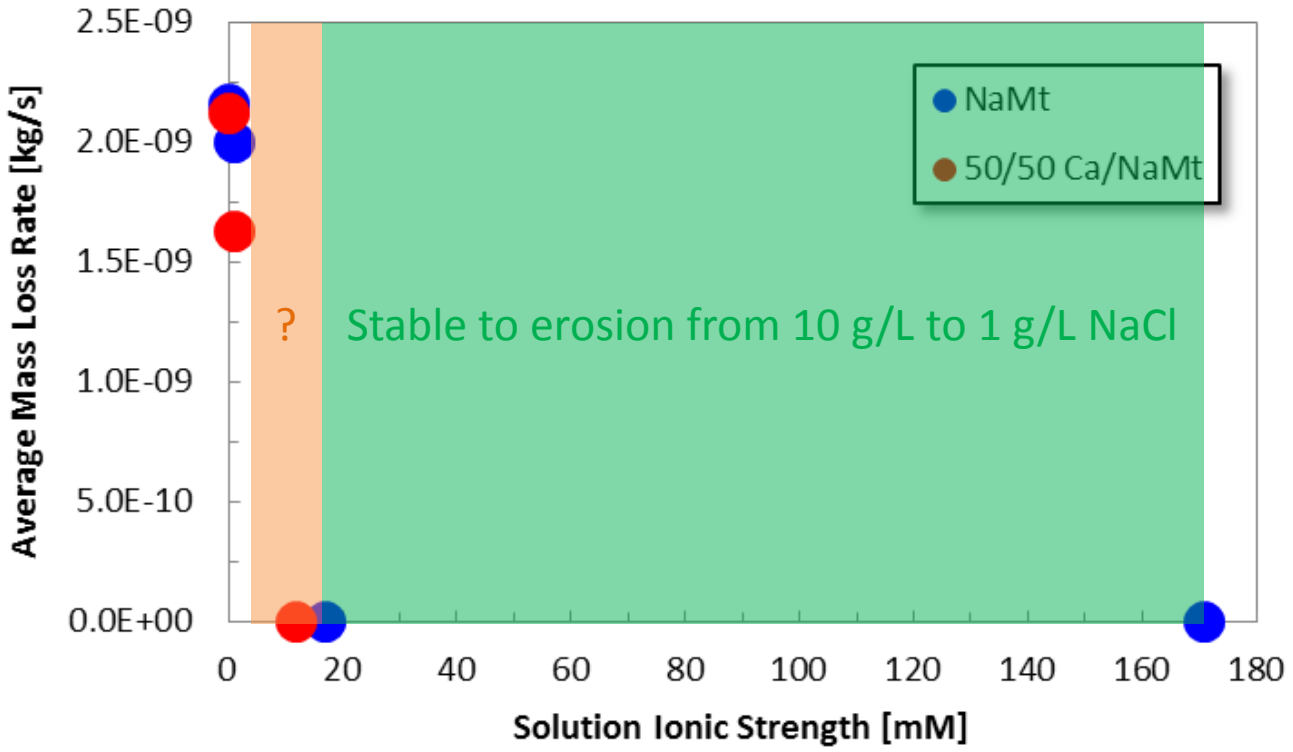


Latest Sloped Fracture Test Results



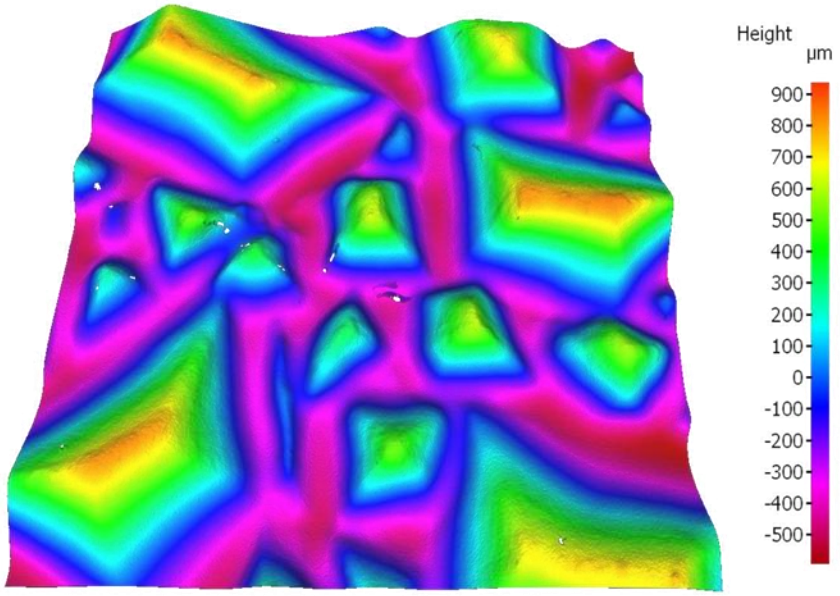
- **Since Meiringen:**
  - **Erosion stability relative to solution ionic strength.**
  - **Erosion in rough-walled fracture system.**

Erosion Stability in Sloped Fractures



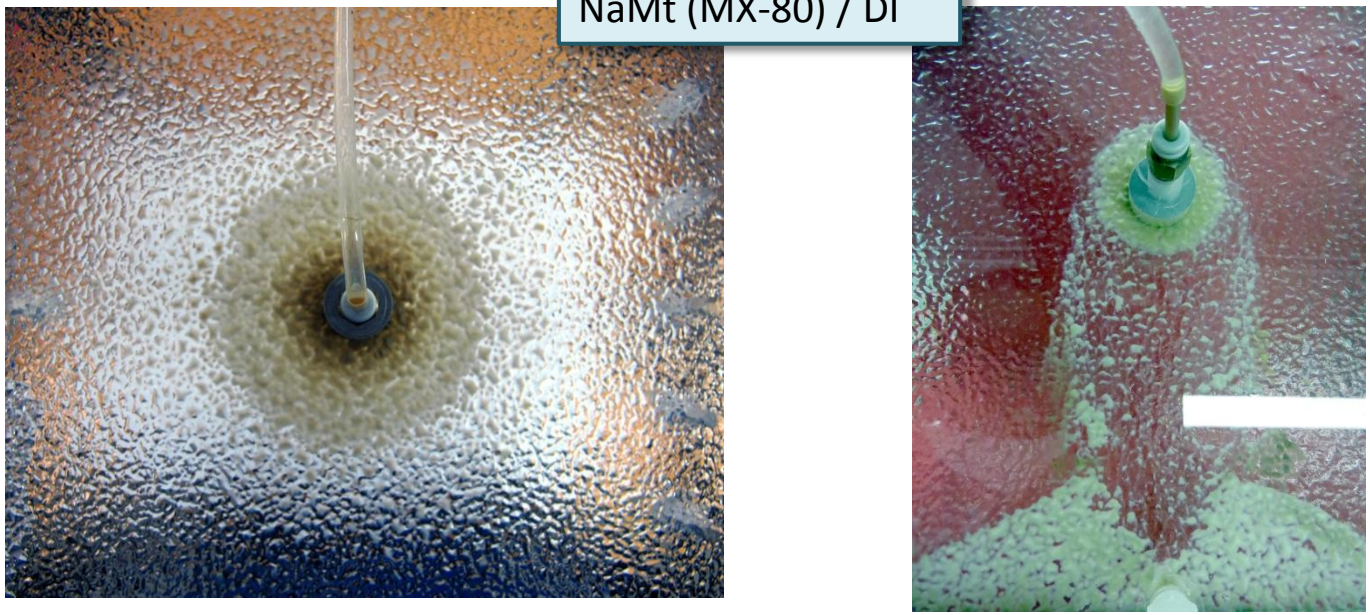
- **Similar stability to that observed in horizontal fracture tests.**
- **However, currently running tests show evidence of mass loss at 0.5 g/L NaCl.**

Rough-Walled Fracture System



- **Rough-walled, artificial fracture system with topographical features from micron to millimeter scale.**
- **Average aperture = 0.95 mm.**

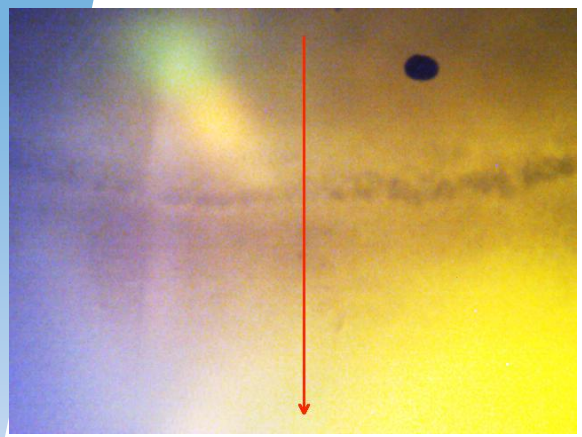
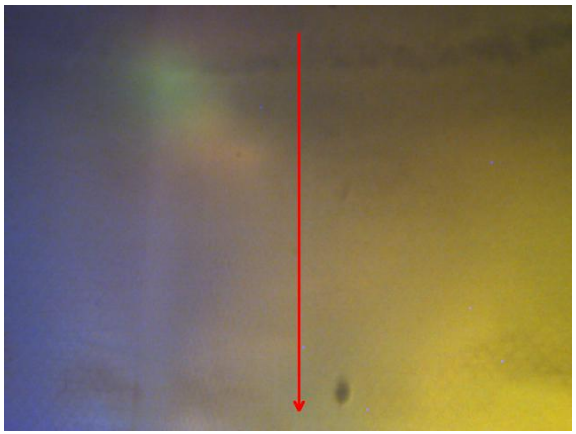
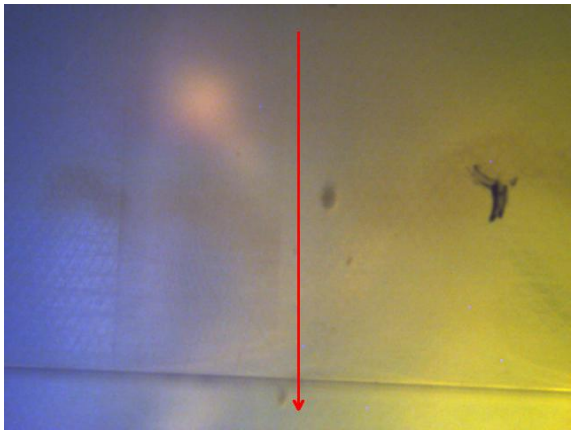
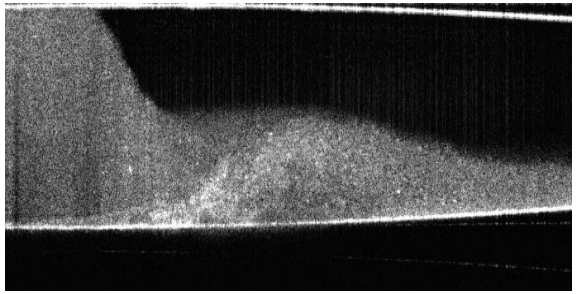
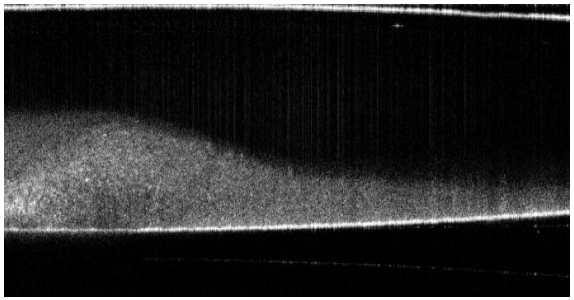
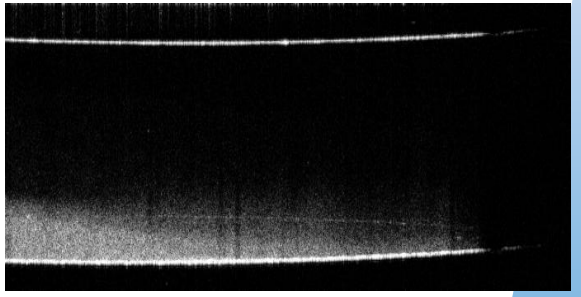
Rough-Walled Fracture Tests



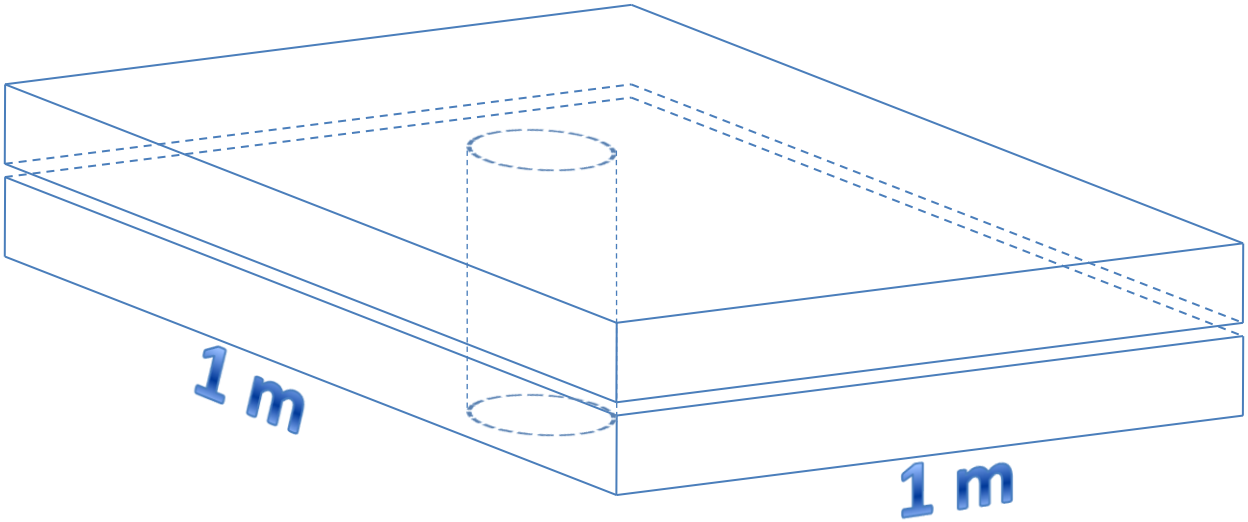
- **Compared to tests in smooth-walled fracture at 1 mm aperture with the same material, solution and inflow rate:**

  - **average mass loss rates are lower by more than a factor of 2 in a horizontal position but equivalent in sloped fractures.**

Clay Sedimentation in Flow Path

Larger Fracture System Test

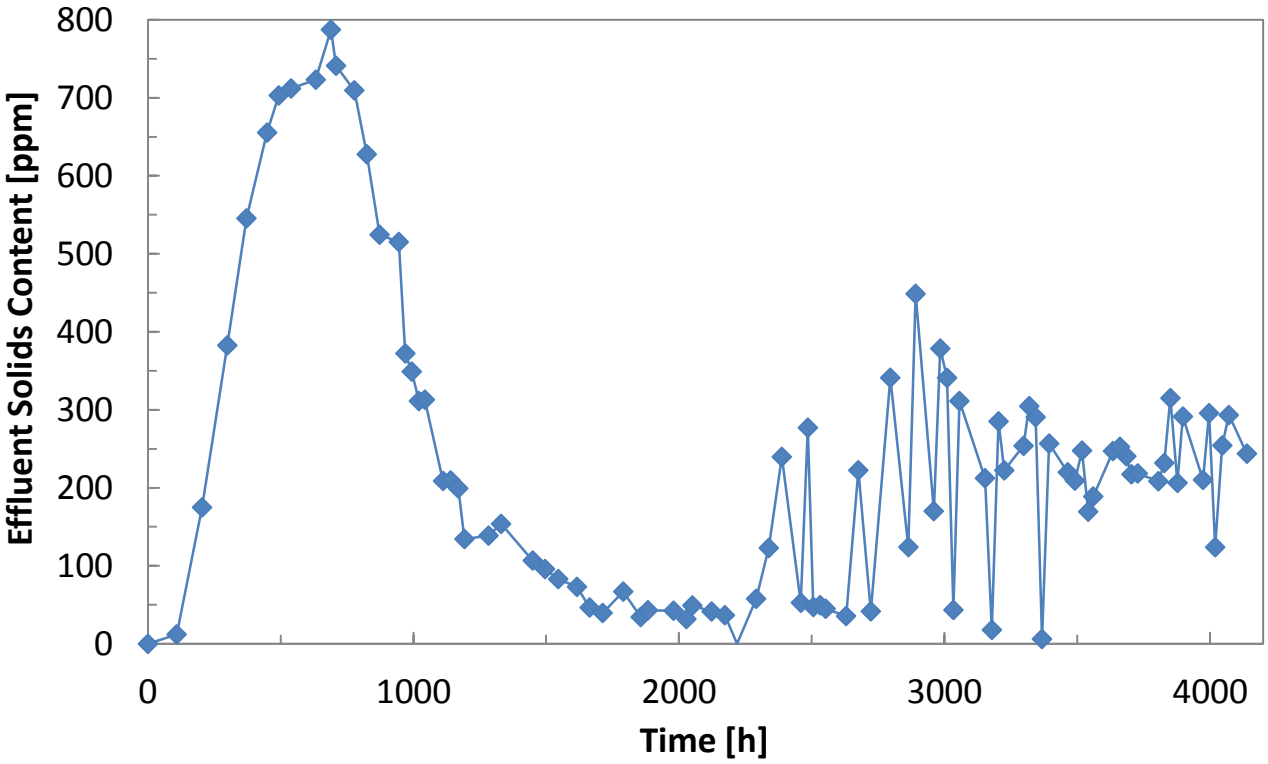


Initial Sample Volume = 98.2 cm^3

Current Status

- **Test running for six months:**
  - **extrusion diameter of ~330 mm.**
  - **continuous erosion observed over duration.**

Larger Fracture Test Results



- Current test will be stopped next week.
- Next up will be a sloped fracture test.

Comparison of Project Test Results

- The BELBaR Project should produce a database of artificial fracture results in order that mass loss rates, etc. can be more easily compared and analyzed.

- Data sets should include:
  - material identity
  - solution composition
  - flowrate
  - aperture
  - extrusion distance data
  - mass loss data
  - other relevant information

- Ultimately mass loss rates should be normalized (adjusted to a notionally common scale; rate/SA) for comparative purposes.

Comparison of Test Results, Cont.

- The database (i.e., as simple as Excel files) could be hosted, for example, on the project website.
- Input and updated at the convenience of the data providers (hopefully sooner than later)
- Accessible to all project participants for their possible interest and analysis.
  - Facilitate reporting.

Benchmark Testing Update

- The latest test protocol (August 2014) will be followed.
- Operators have all received the single source montmorillonite material.
- 4 out of 5 are in various stages of preparation or actual testing.