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# Thermal, mechanical and hydrologic characterization for model development and modeling of deep borehole disposal of nuclear waste in Israel



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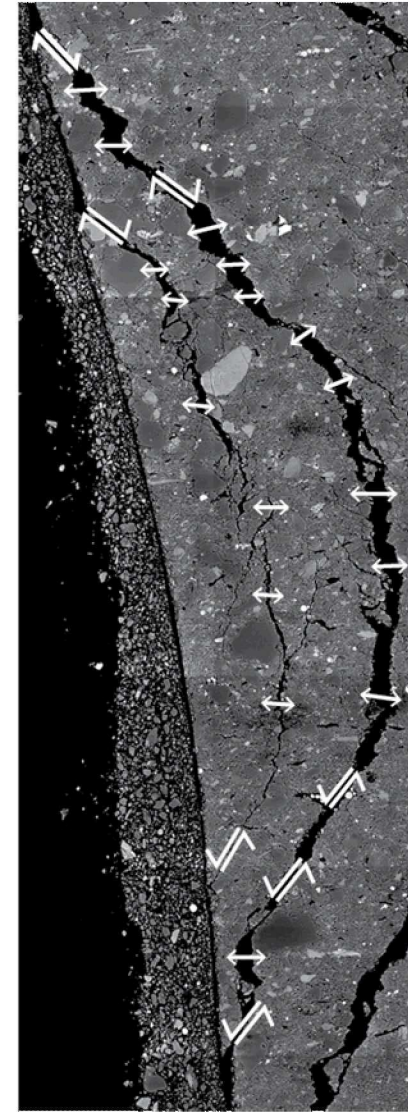
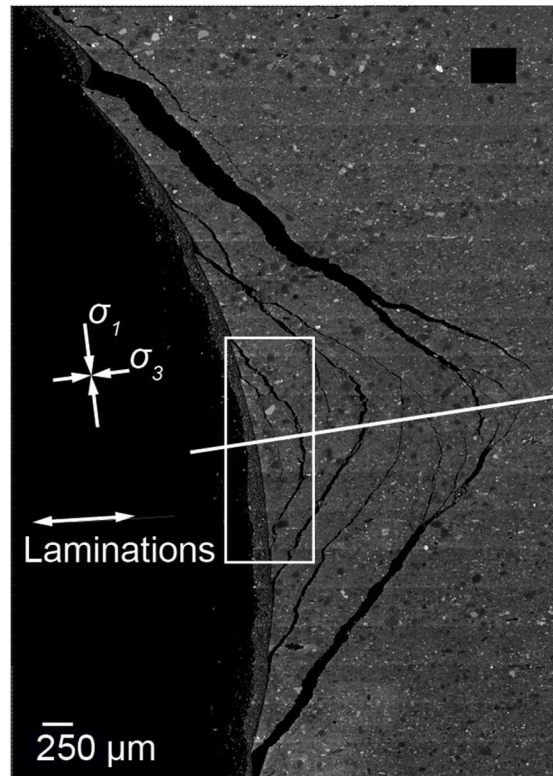
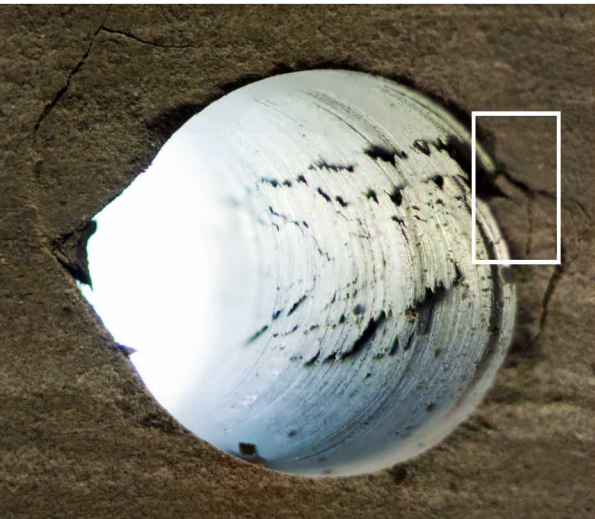


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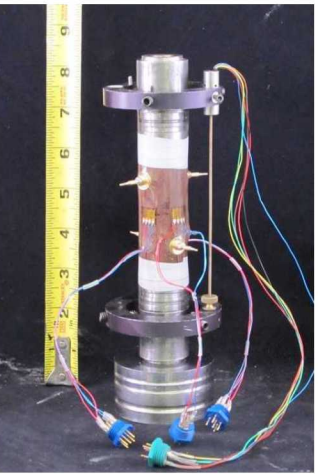
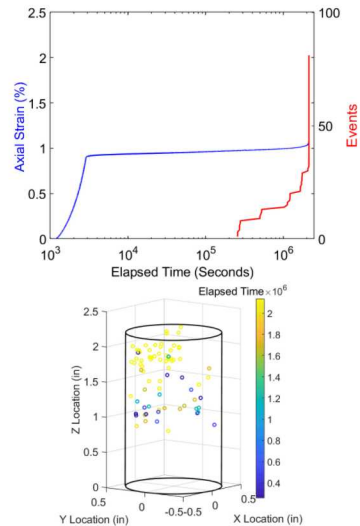
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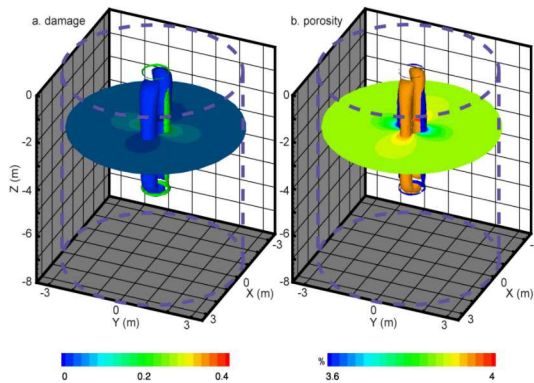
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## Modeling Excavation Damage

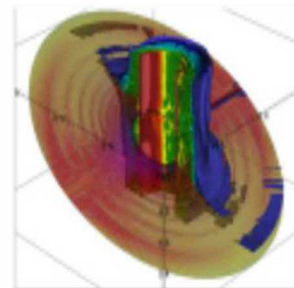
- Integrated approach for simulating well bore damage across time scales:
  - LLNL simulation of short time damage mechanisms and fault/joint interactions
  - GSI/NRCN simulation of long time-scale “stress erosion” damage
- Demonstrated ability to match available experimental data for the Israel rock, and to simulate both dynamic and stress-erosion damage mechanisms
- Currently preparing a collaborative publication on the integrated approach for simulating excavation-induced damage and wellbore instability



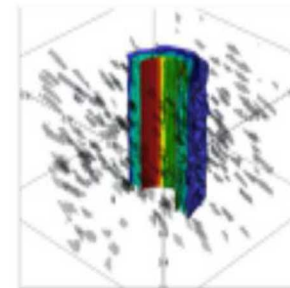
Quasi-static mechanical, thermal and hydrologic properties of Zenifim arkose determined; time and temperature dependencies of properties are underway



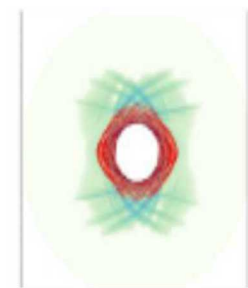
Breakouts evolution for arkose at depth of five km and anisotropic stress regime ( $\sigma_h=0.7\sigma_v$ ,  $\sigma_H=1.3\sigma_v$ ).



Damage and slip at the intersection of a natural fracture with the well bore



Effect of joint slip near well bore damage field



Simulation showing

