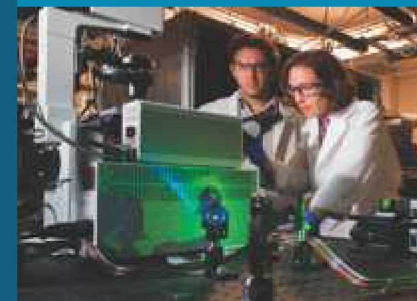
SAND2020-5948PE

Introduction to Room Collapse and Reconsolidation Research



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Org. 1558, Materials and Failure Modeling

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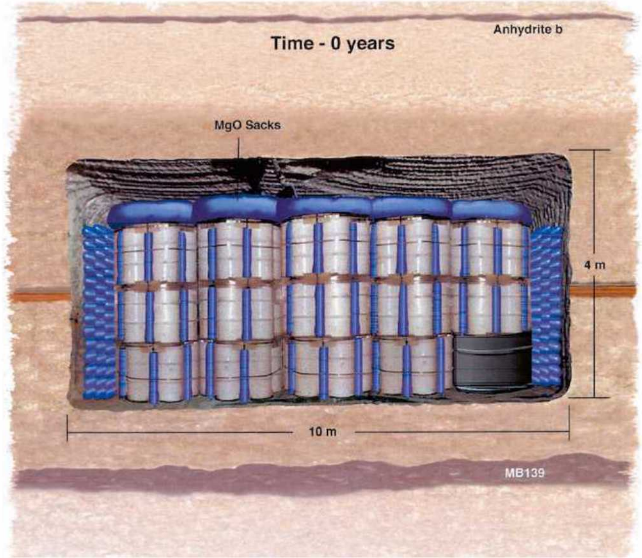
Filled Room Closure vs. Empty Room Closure

Filled Rooms



Empty Rooms

Relevant Physical Phenomena

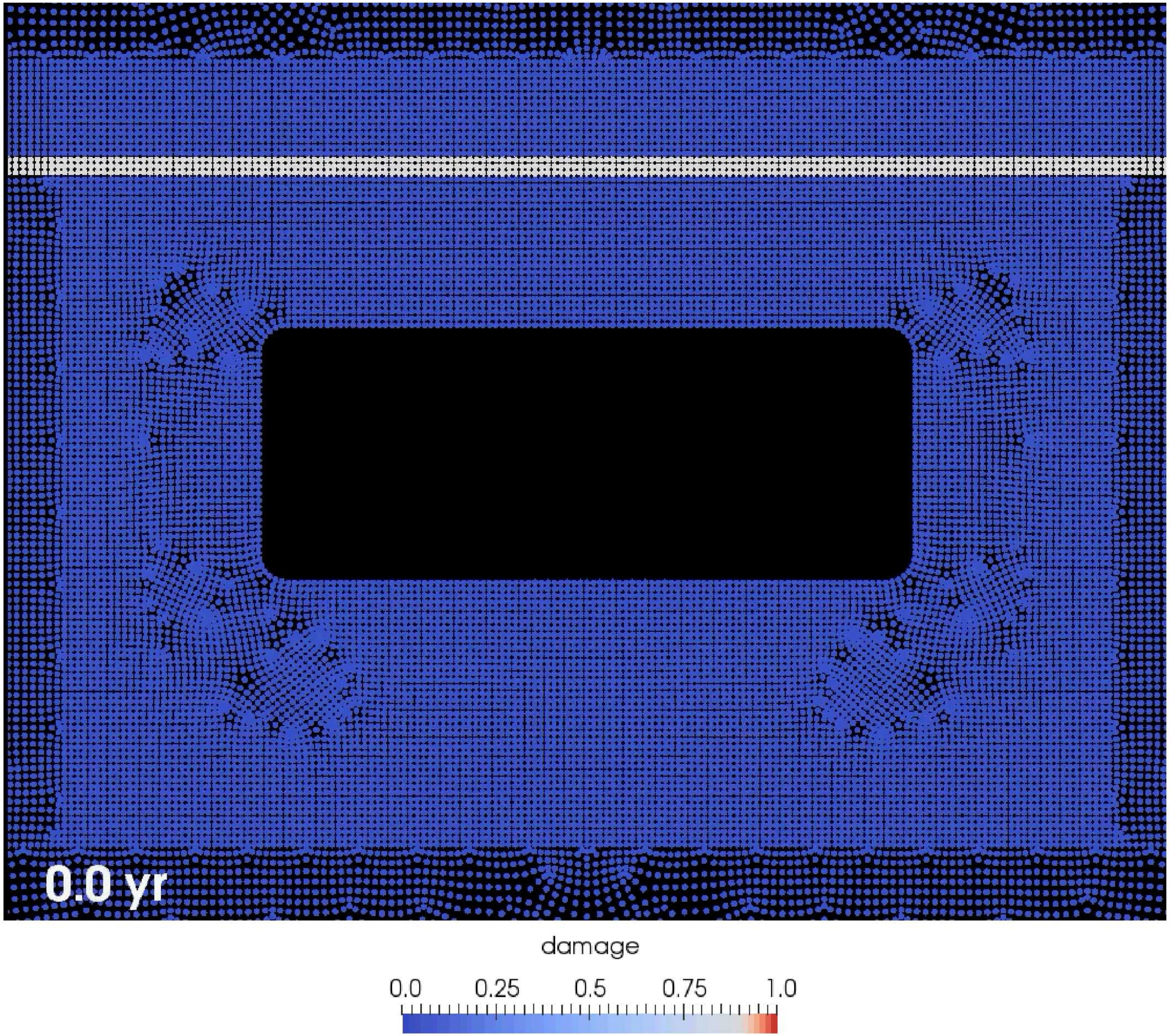
1. Gradual room closure
   a. Driving force for empty room closure

2. Fracturing around room
   a. Changes room shape and size
   b. Controls the size and character of rubble pile

3. Rubble pile reconsolidation
   a. Involves rearrangement, fracture, dislocation-based viscoplasticity, and pressure solution redeposition
   b. Rubble supplies back pressure

4. Flow through the rubble pile
   a. Depends on flow network as well as pathway size, roughness, and tortuosity.

Meshless Simulation of Room Collapse



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Research Plan

1. Model Development
   a. Assessed candidate numerical methods
      i. Published "Initial Simulations of Empty Room Collapse and Reconsolidation at the Waste Isolation Pilot Plant" (SAND2019-15351)
      ii. "Consolidated" the report into two smaller ARMA conference papers.
   b. Currently improving the salt constitutive model
   c. Currently implementing the Conforming Reproducing Kernel (CRK) method in Sierra/Solid Mechanics
   d. Currently generating synthetic rubble piles and simulating flow through them
2. Model Validation
   a. Currently performing lab-scale room collapse experiments
   b. Plan to validate rubble pile reconsolidation predictions against polydispersed crushed salt experiments
   c. Preparing to make 1/10th scale rubble permeability measurements
   d. May be able to validate against abandoned drift compaction at Teutschenthal mine in Germany

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