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Damage Induced by Excavation and Heat Release of a Radioactive Waste Repository

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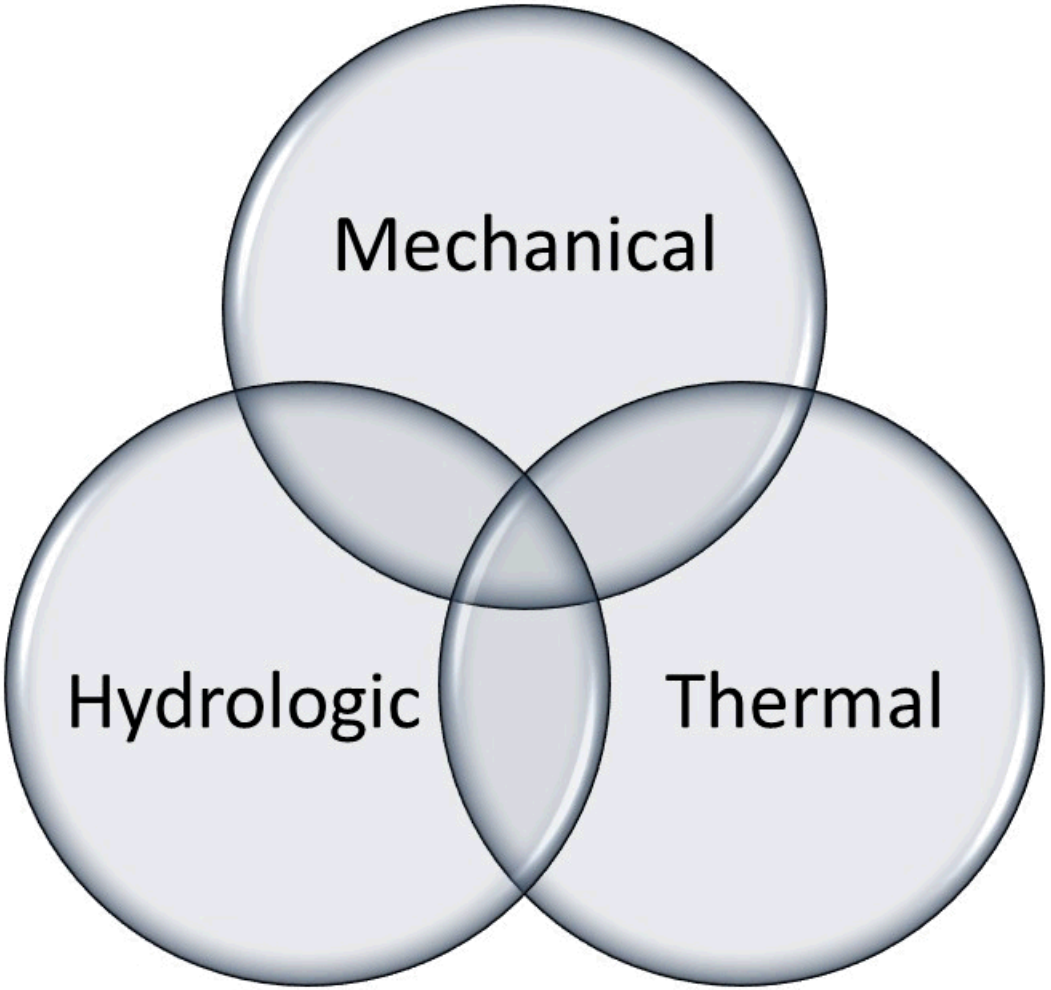
Damage induced by:

- Excavation
- Heat

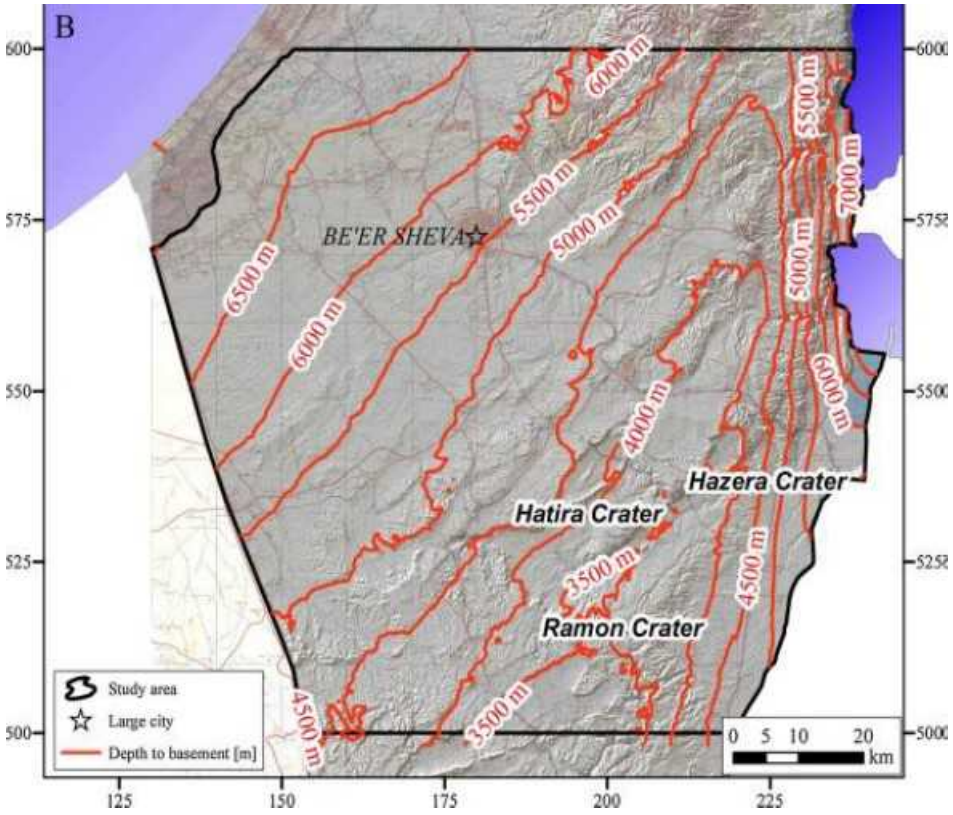


Coupled nature of operative processes

Tasks

	2017	2018	2019
Task 1: Modeling Damage Created by Excavation			
Task 2: Experimental study of the **mechanical** and **transport properties** for dry and saturated rock samples			
Task 3: Non-isothermal damage-porosity visco-elastic rheological model			
Task 4: Experimental study of **thermal properties**			
Task 5: Modeling Damage Created by Heat			
Task 6: Long Term Modeling Damage Evolution of Radioactive Waste Repository			
Task 7: Code Modernization and Parallel Execution			

Target Horizon: Zenifim Formation



Depth of Zenifim formation (Calvo & Gvirtzman, 2013)

Depths of interest: 3-5 km;
70-100MPa confining pressure
Temperatures: ambient to 350C
Dry, water saturated

50% feldspar (oligoclase-andesine)
40% quartz, 10% lithics, biotite,
chlorite, hornblende (Weissbrod & Sneh 2002)

Rock Core transfer to Sandia

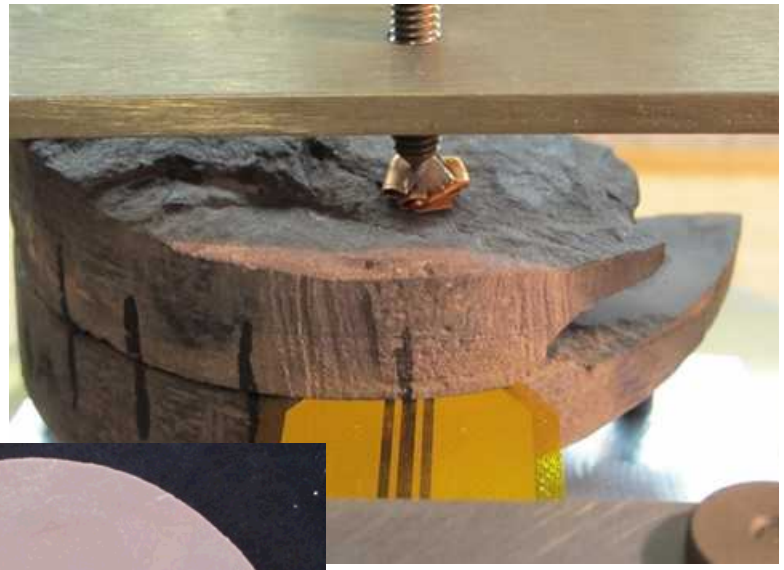
Thermal, mechanical, and hydrologic property determinations initiated

Thermal Properties

Conductivity: (W/mK) the property of a material to conduct heat

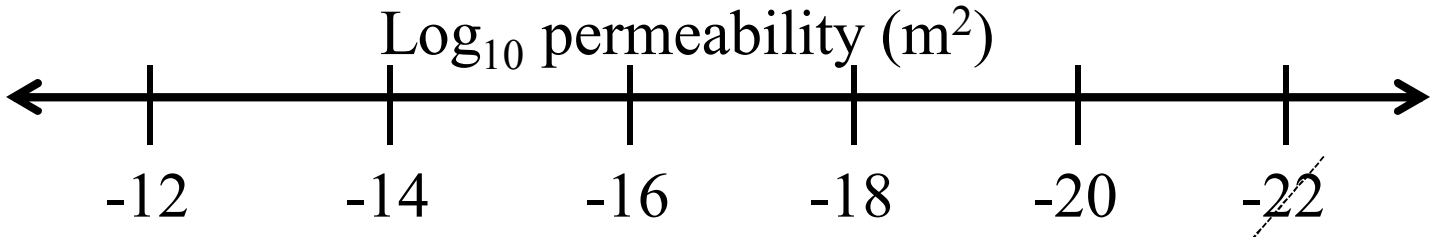
Diffusivity: (mm^2/s) measure of thermal inertia

Specific Heat: (MJ/m^3K) the amount of heat per unit mass required to raise the temperature by 1 ^oC



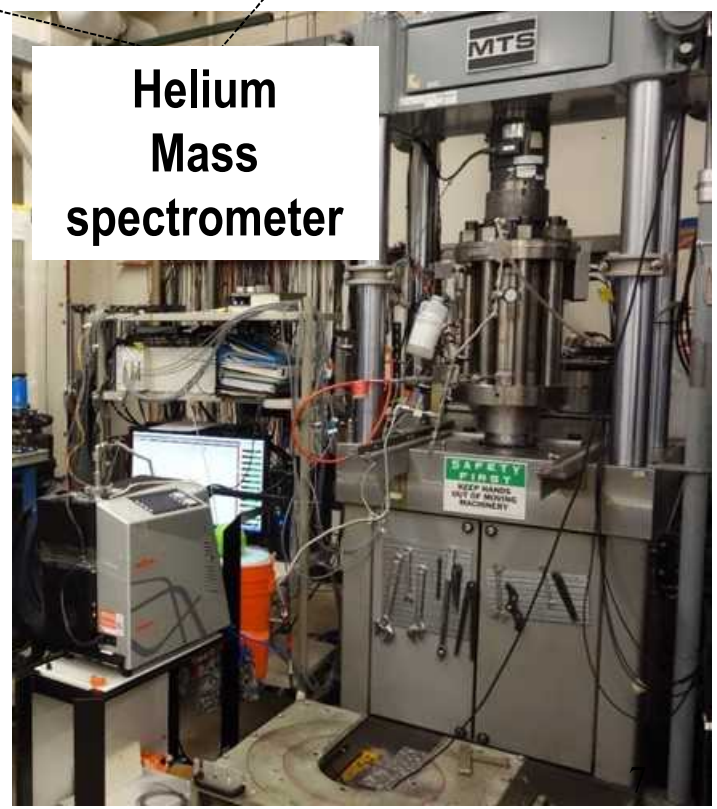
Hydrologic Properties

Porosity, Permeability: f(pressure, temperature, deformation)



Flowmeters

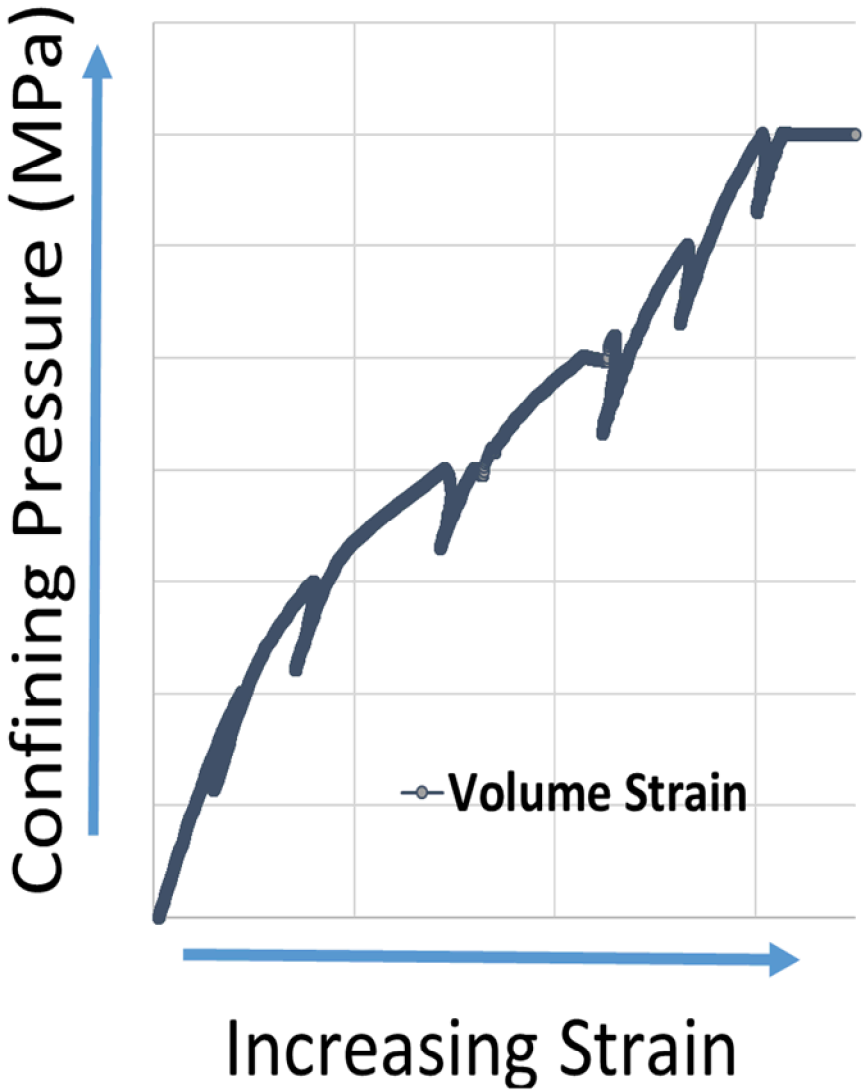
Helium Mass spectrometer

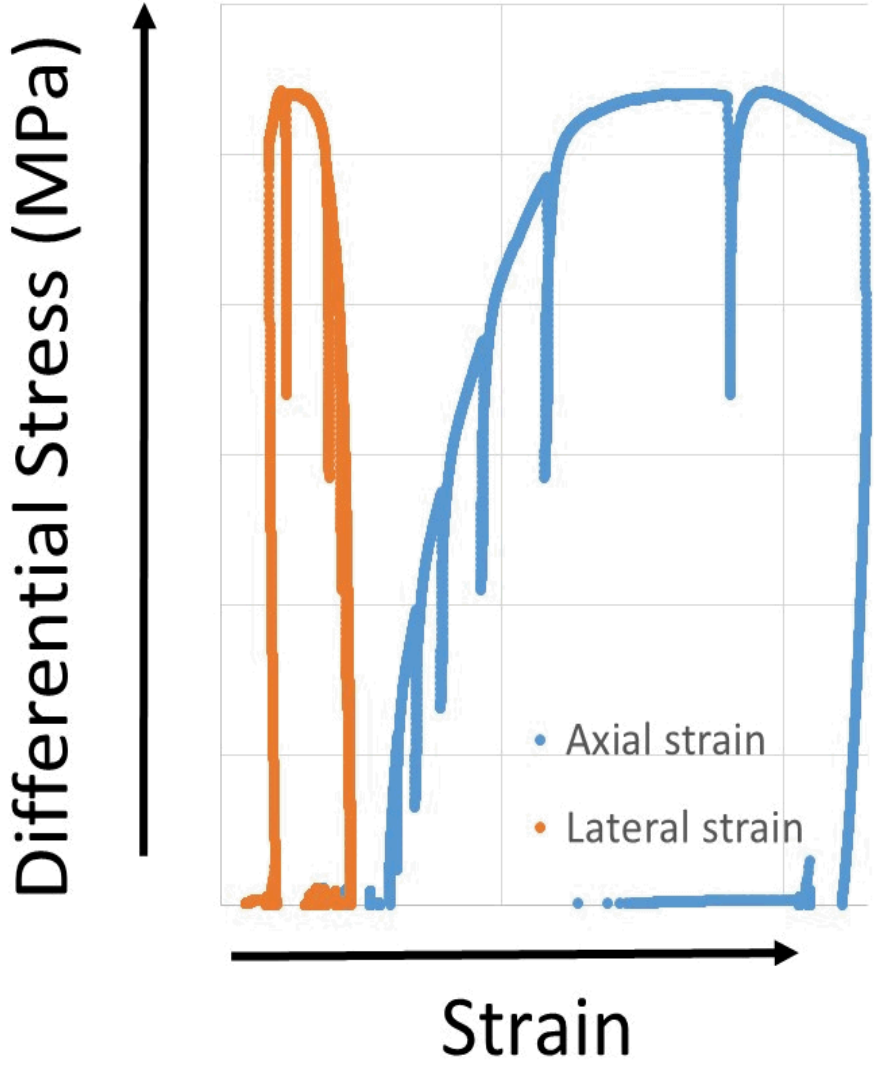


Elastic and Strength Properties

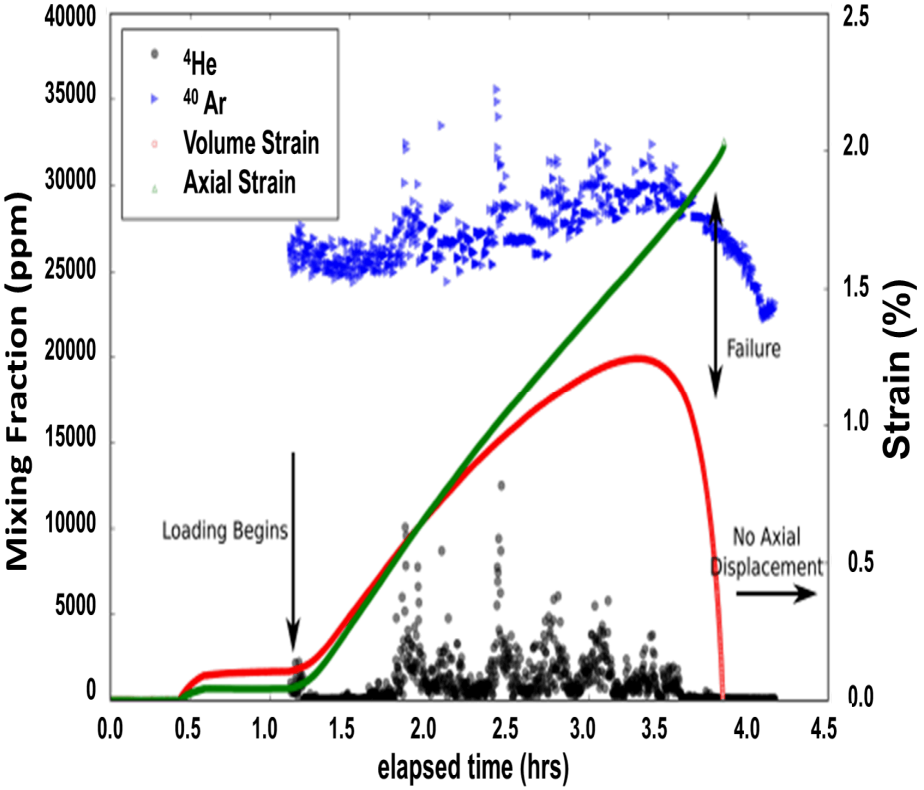
E, μ, β, strength criterion: f(temperature, pressure, strain/stress)

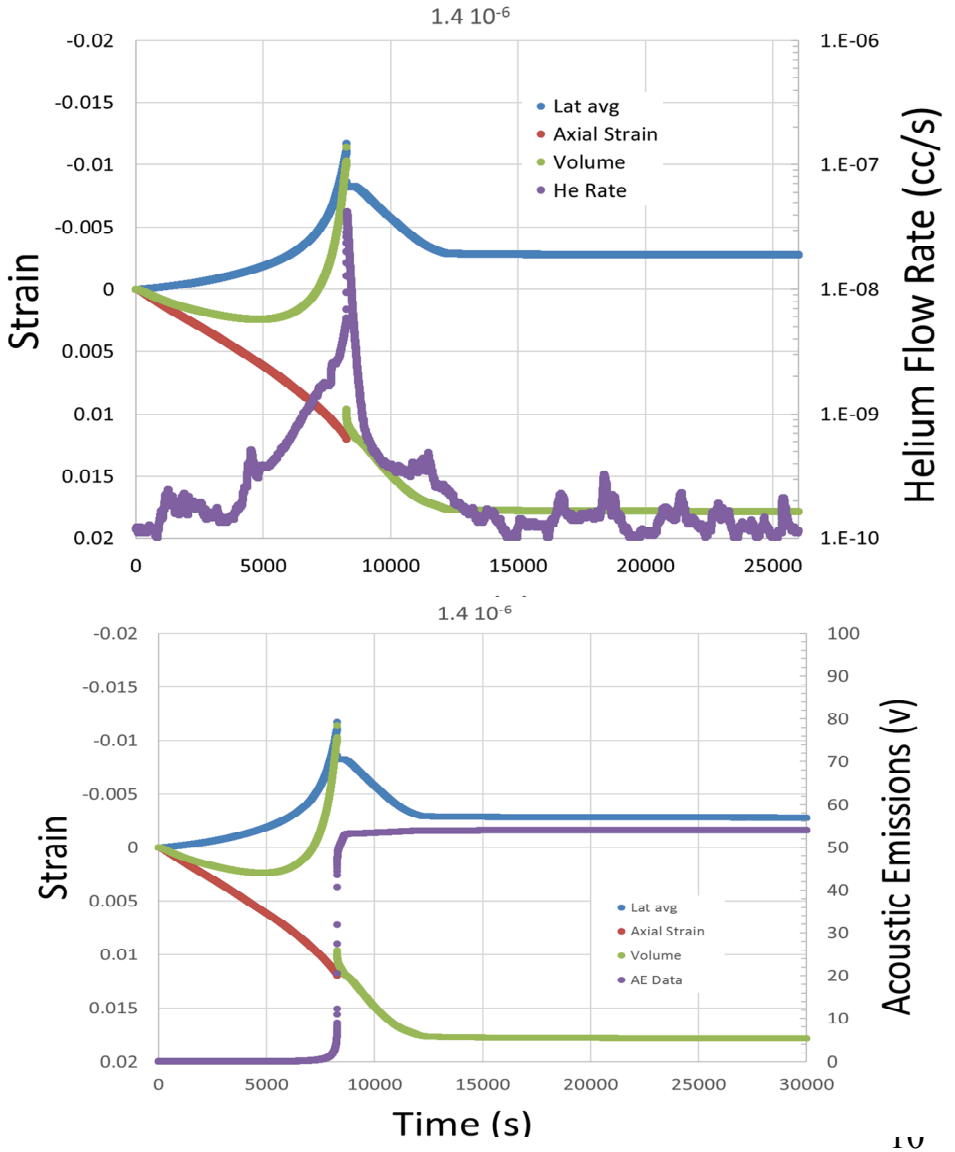
Example data





Example data 2: Real-time Noble Gas Release and Acoustic emissions Westerly granite





Bauer et al 2016

Example data: Thermal Properties

Conductivity: (W/mK)

Diffusivity: (mm^2/s)

Specific Heat: (MJ/m^3K)