

# Capillary Pressure Measurements Using Real Rock Micromodels

**Shadya Taleb**

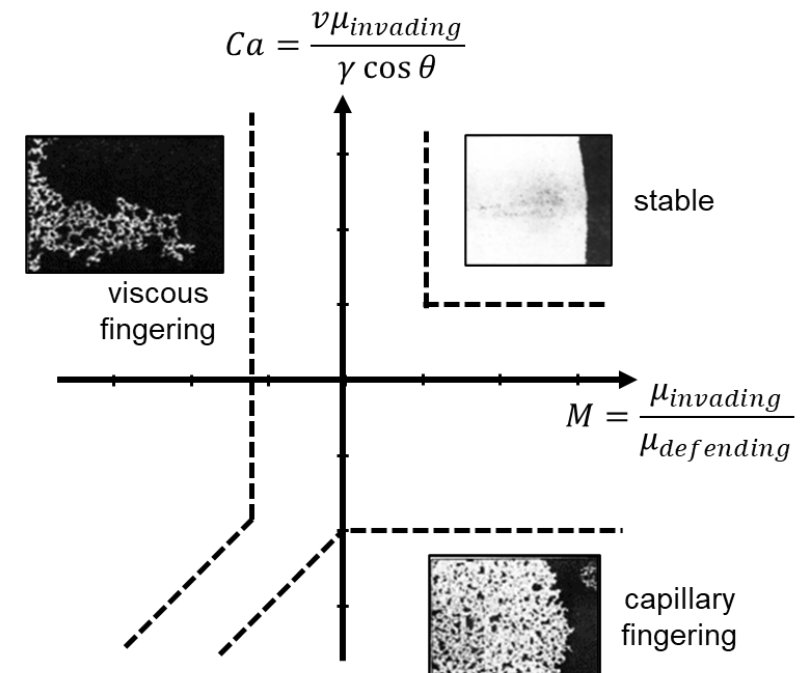
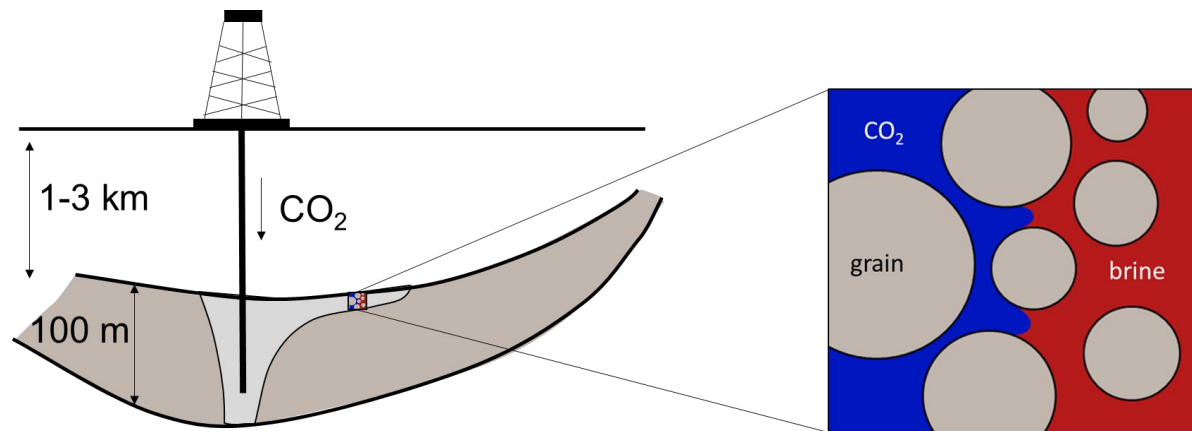
**M.S. Thesis Supervised by: Dr. Seyyed A. Hosseini**

**([seyyed.hosseini@beg.utexas.edu](mailto:seyyed.hosseini@beg.utexas.edu))**



# Motivation

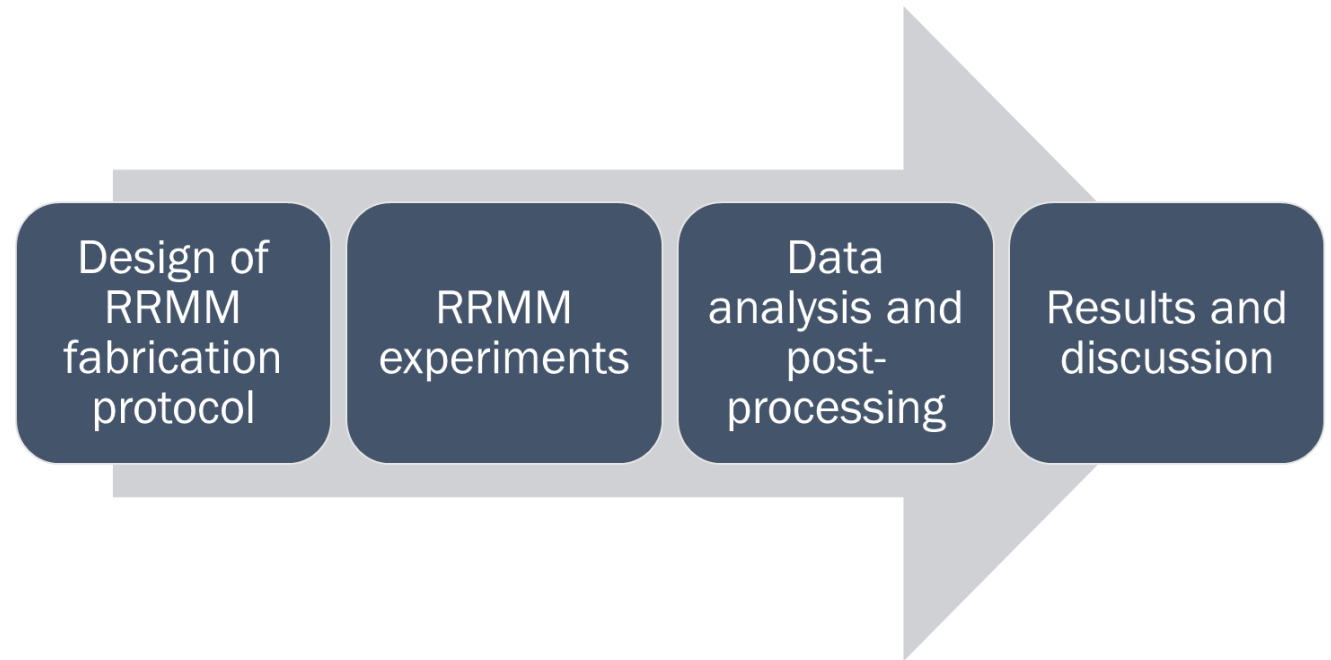
- Capillary pressure plays an important role when predicting dynamic processes in the subsurface.
- A reliable capillary pressure curve must be used to model CO<sub>2</sub>-brine injections at reservoir scale.



Lenormand et al. (1988)

# Objectives

- Develop a protocol for real-rock micromodel fabrication to investigate:
  - Fluid distribution (Brine/scCO<sub>2</sub>)
  - Sweep efficiency
  - Capillary pressure curves

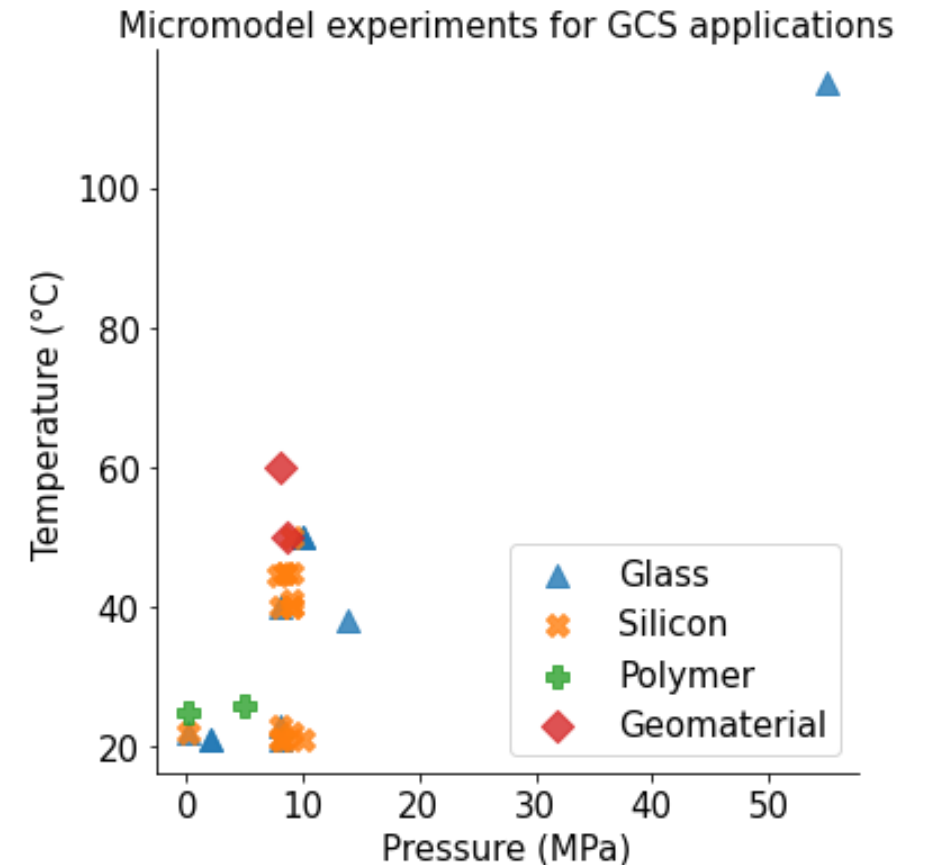


# Why this matters

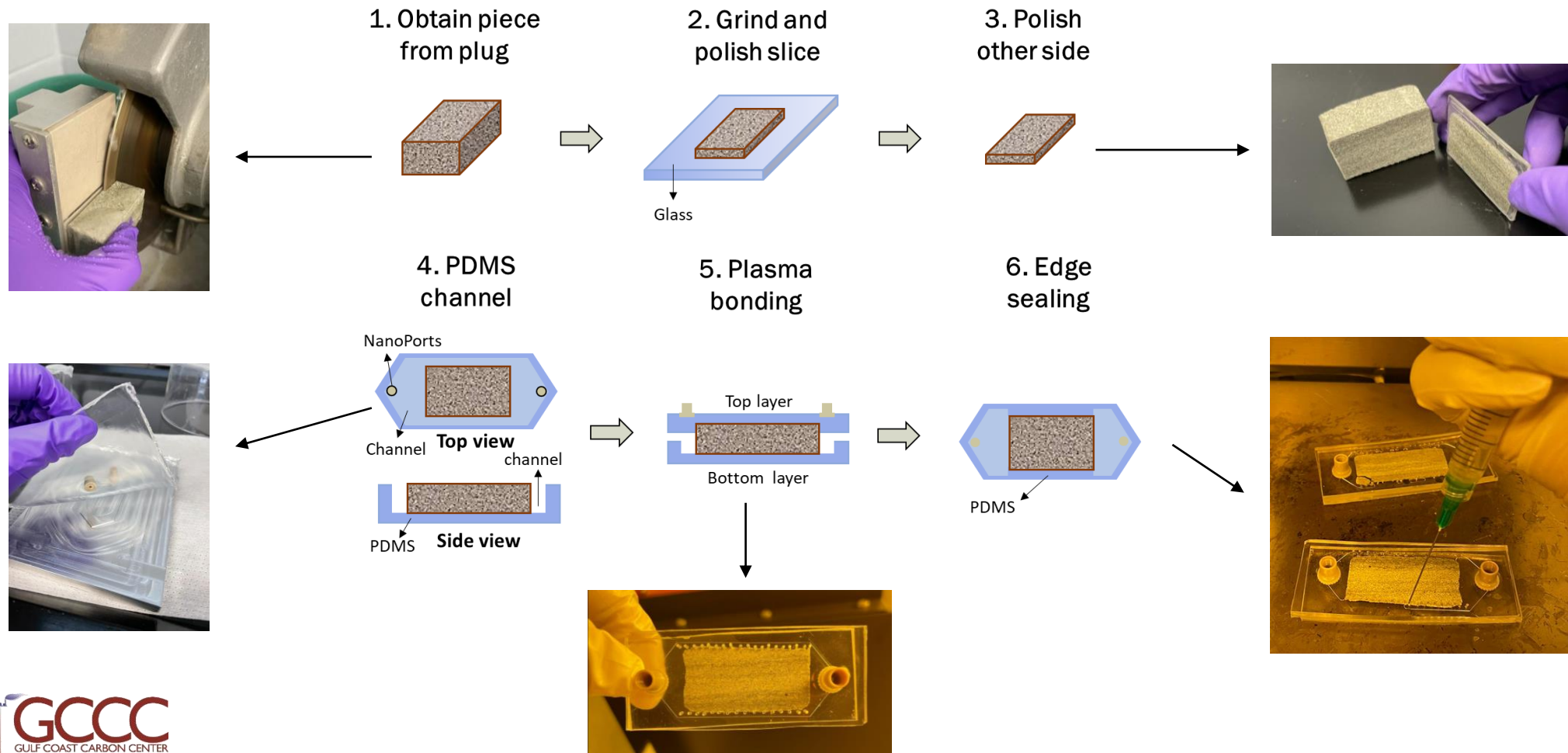
## • Why real-rock micromodels (RRMM) ?

Benefits of RRMM:

- ❖ Pore scale phenomena: *Real mineral composition*
- ❖ “Core-flooding on a chip”: *Optically accessible*
- ❖ Current Pc methods: *Mercury, Porous plate, Centrifuge:*  
*Smaller samples, faster timing and lower cost*



# Real-rock Micromodel Fabrication



# Materials

## Fluids:

Fluid	Density (kg/m <sup>3</sup> )	Viscosity (cP) @ 22°C
Glycerol-water 50:50 w/w	1,115.4	6.25
n-Heptane pure	684	0.41

Interfacial tension  
0.036 N/m

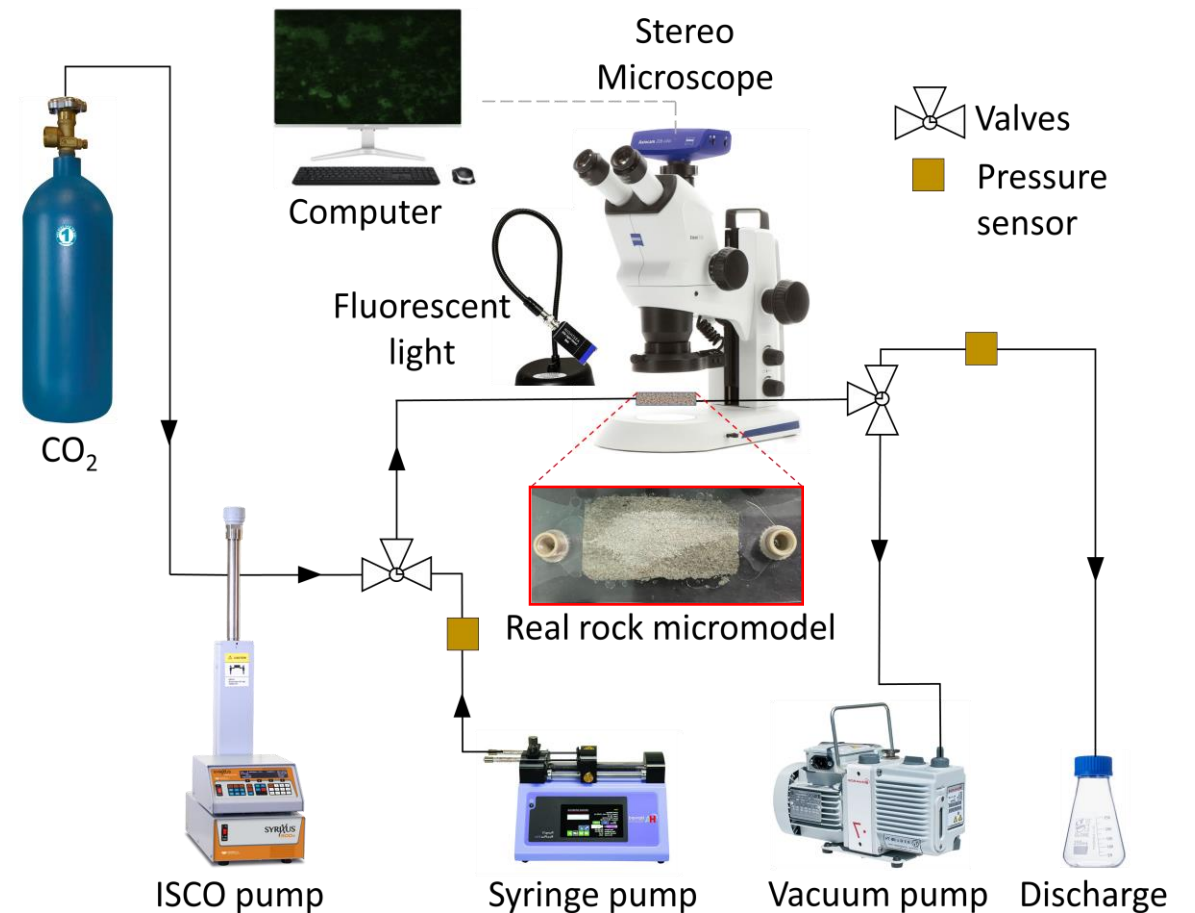
(Krishnamurthy et al., 2022)

## Sample:

Name	CFU Well 31 F-3
Type	Sandstone
Porosity	18.33 %
Depth	10.445'

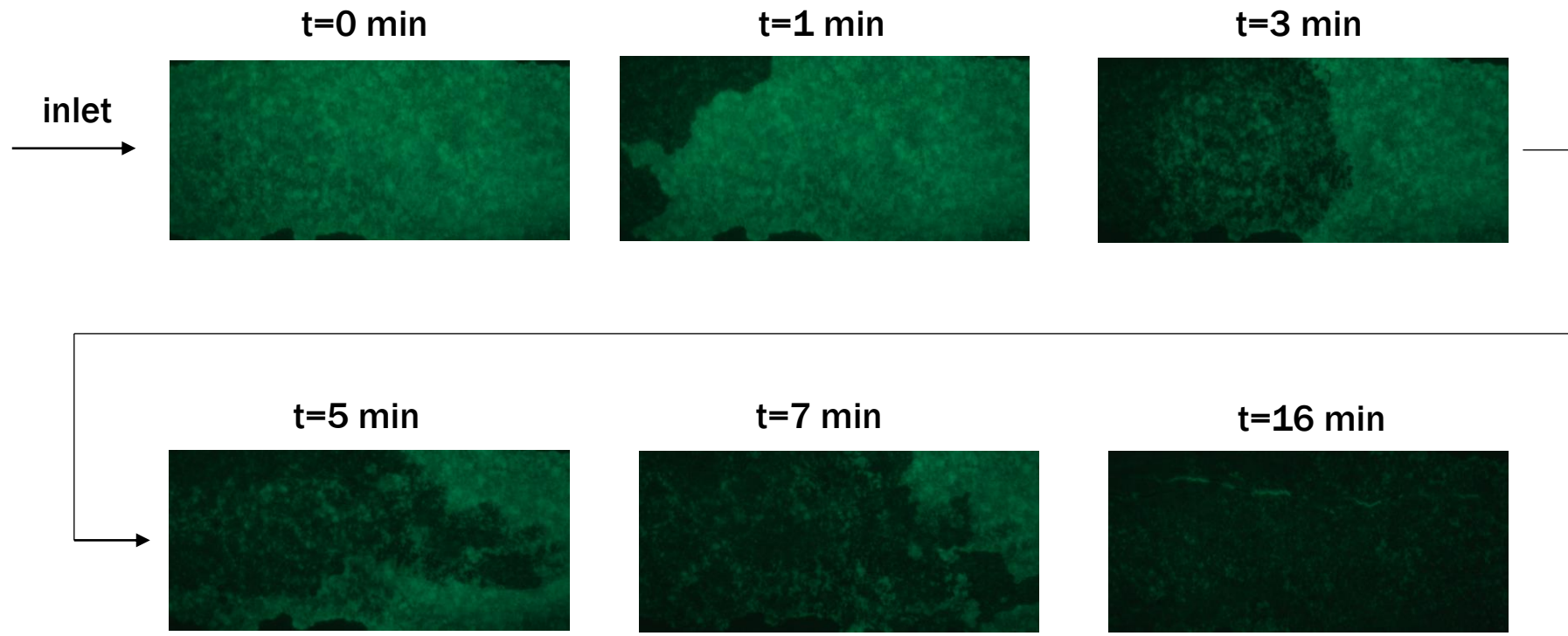
# Experimental setup

## Experimental Setup:



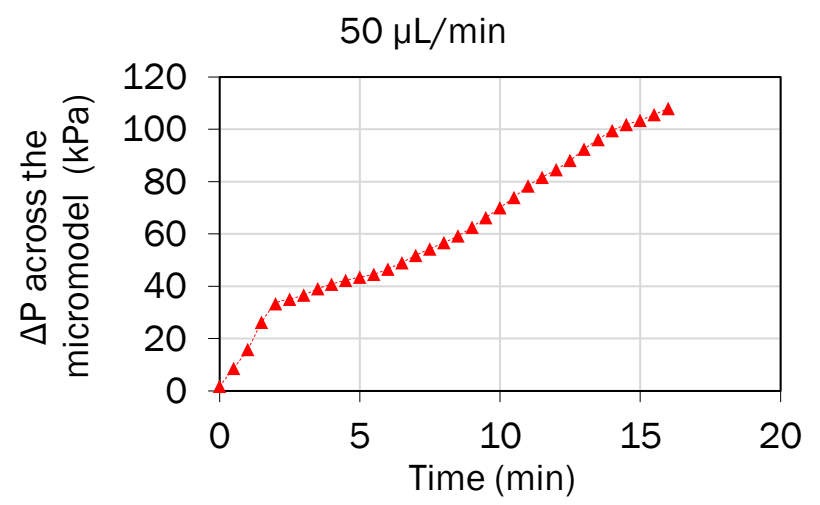
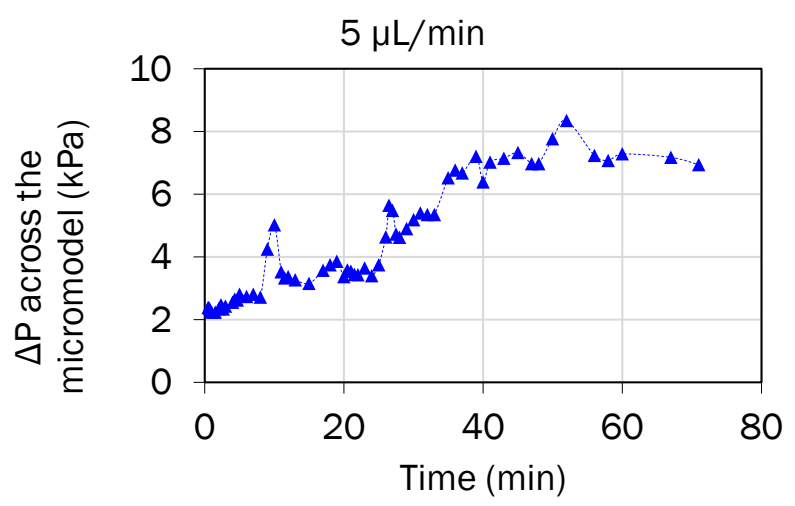
# Preliminary Results

## Non-wetting phase injection

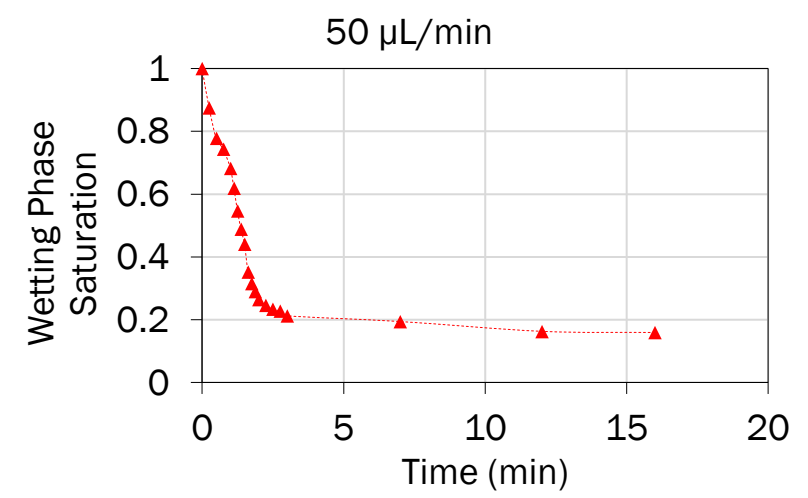
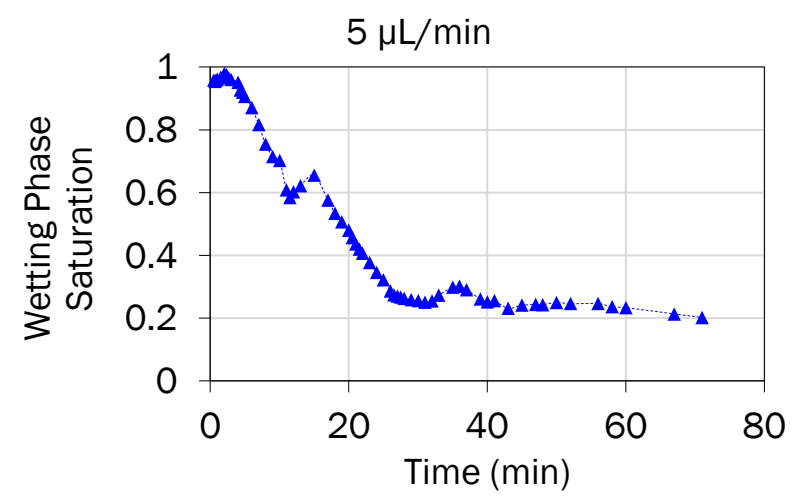


# Preliminary Results

Pressure drop (kPa) vs time →



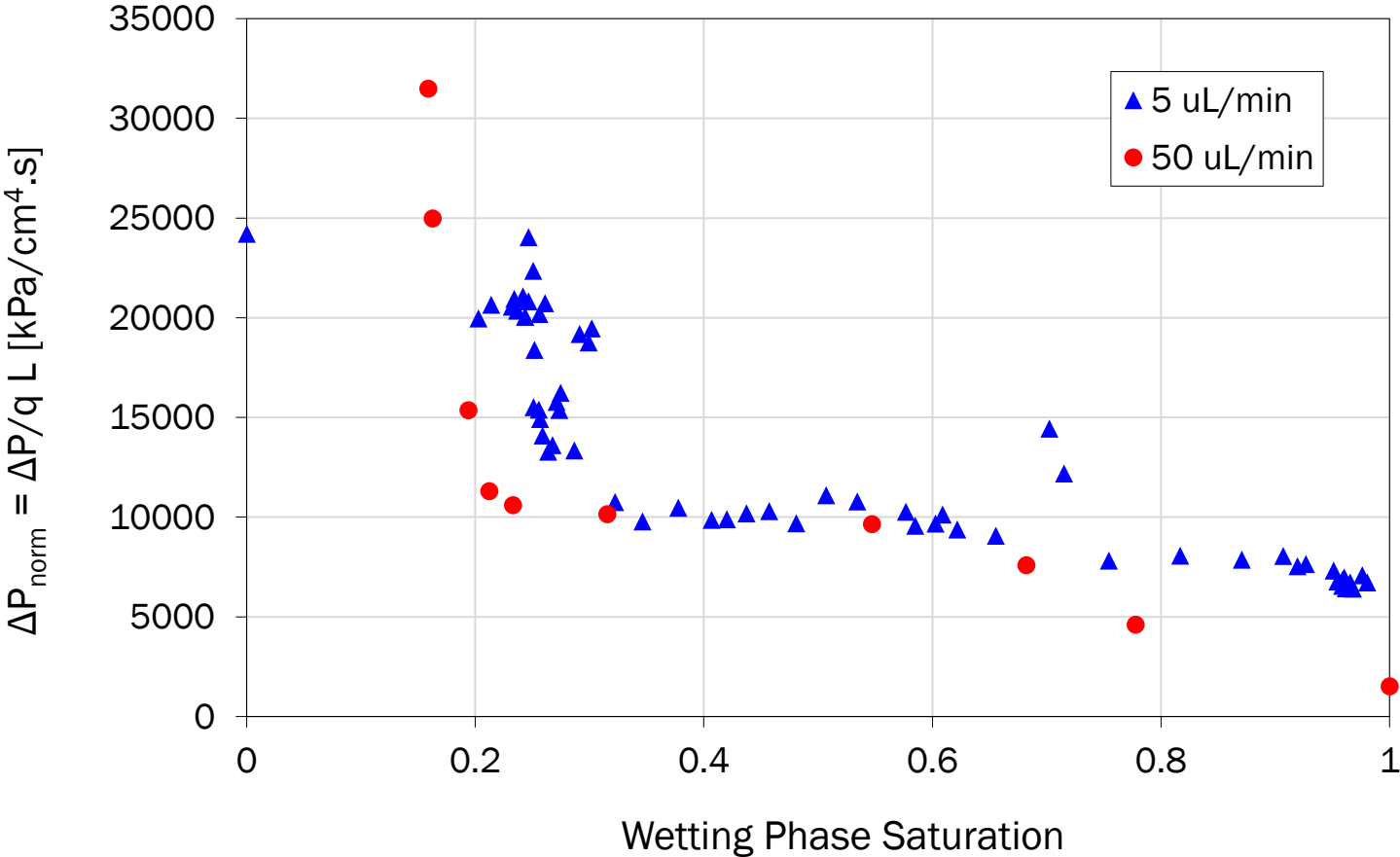
Saturation vs time →





# Preliminary Results

$\Delta P_{\text{norm}}$  vs saturation curves  $\longrightarrow$



# What's next

## • Ongoing Work

- Run new experiments using a different sandstone (i.e., Berea or Mt Simon)
- Compare pressure vs. saturation in micromodel experiments against capillary pressures curves from core-scale measurements

## • Future Work

- Scan thin section to reconstruct model and perform pore-scale simulations
- Use real rock micromodels for other studies (i.e., salt precipitation studies, brine dry-out)
- Use experimental procedure for other applications (i.e., hydrogen storage)