

Establishing an Early CO₂ Storage Complex in Kemper County, Mississippi: Project ECO₂S



S C H O O L O F E N E R G Y R E S O U R C E S

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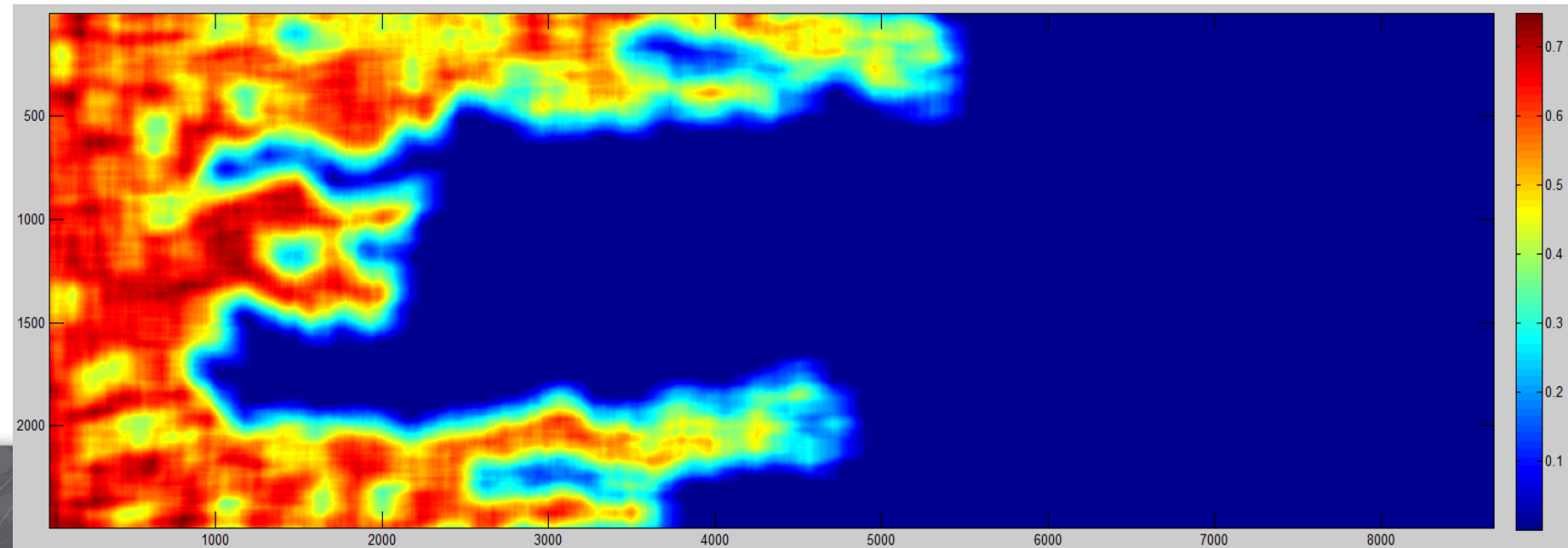
Technical Objectives

1. Reservoir condition core flood analysis

- Establish unsteady state and imbibition conditions during CO₂ injection
- Measure in-situ CO₂ dissolution
- Establish steady state and imbibition conditions during CO₂ injection
- Post-injection core assessment

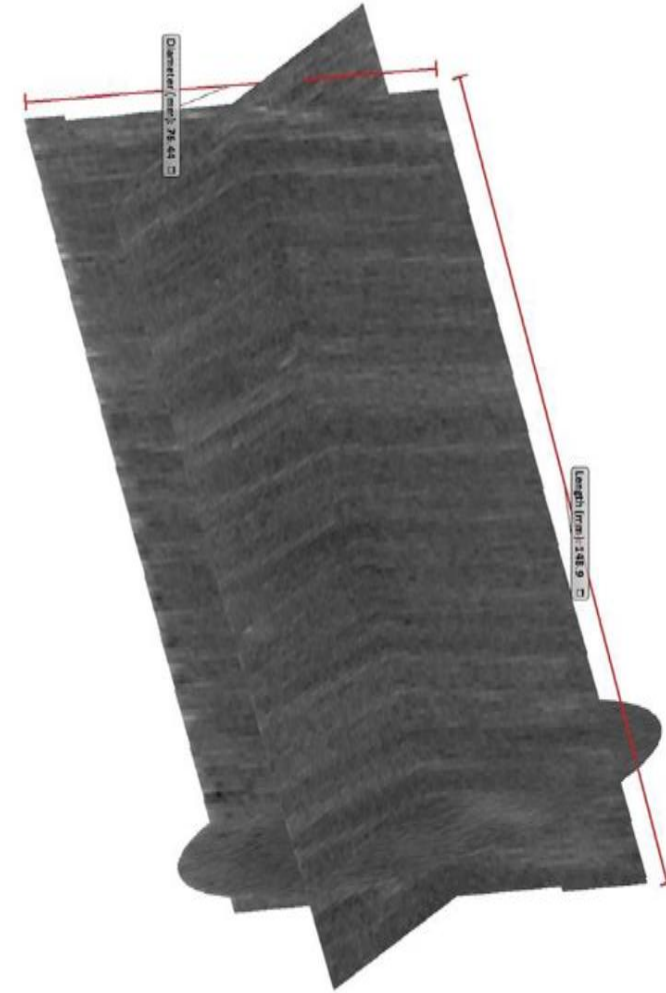
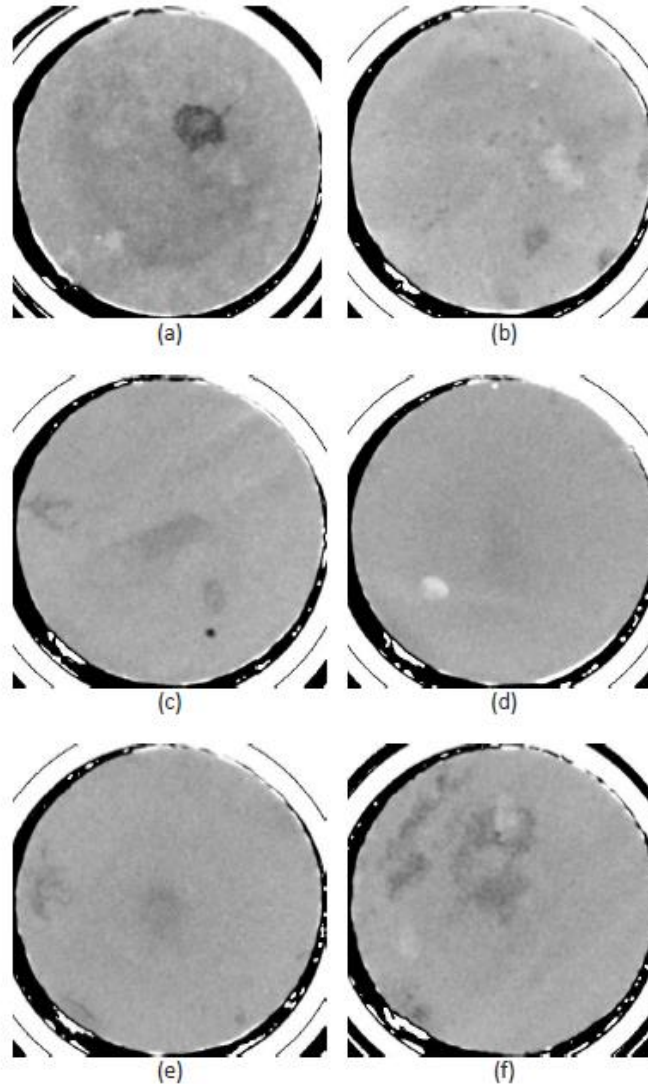
2. Microfluidic experiments

- Develop and test experimental parameters to optimize storage capacities of the mega-porous target reservoirs



Technical Objectives: Core flooding experiments

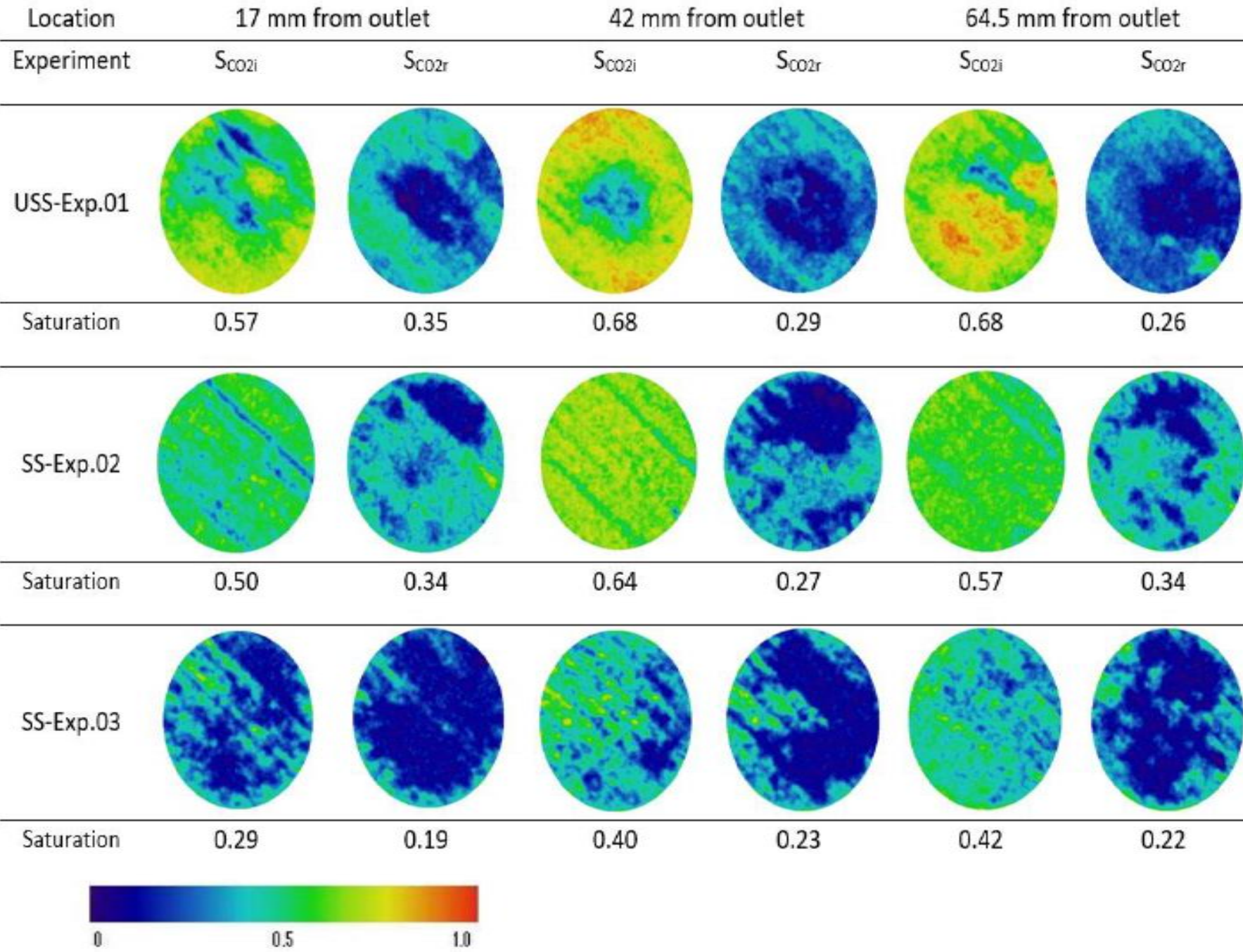
Sampled core from well MPC10-4



Massive sand interval (5059.33 – 5060.53 ft) and from crossbedded sand interval (5115.48 – 5116.88 ft)



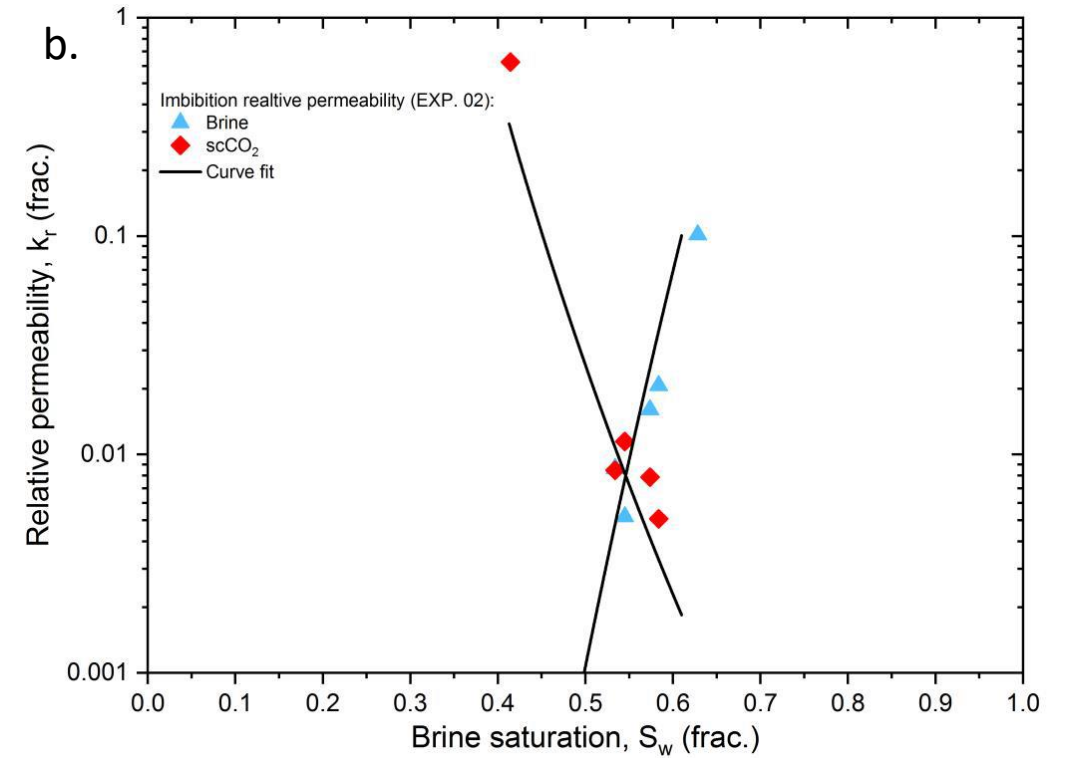
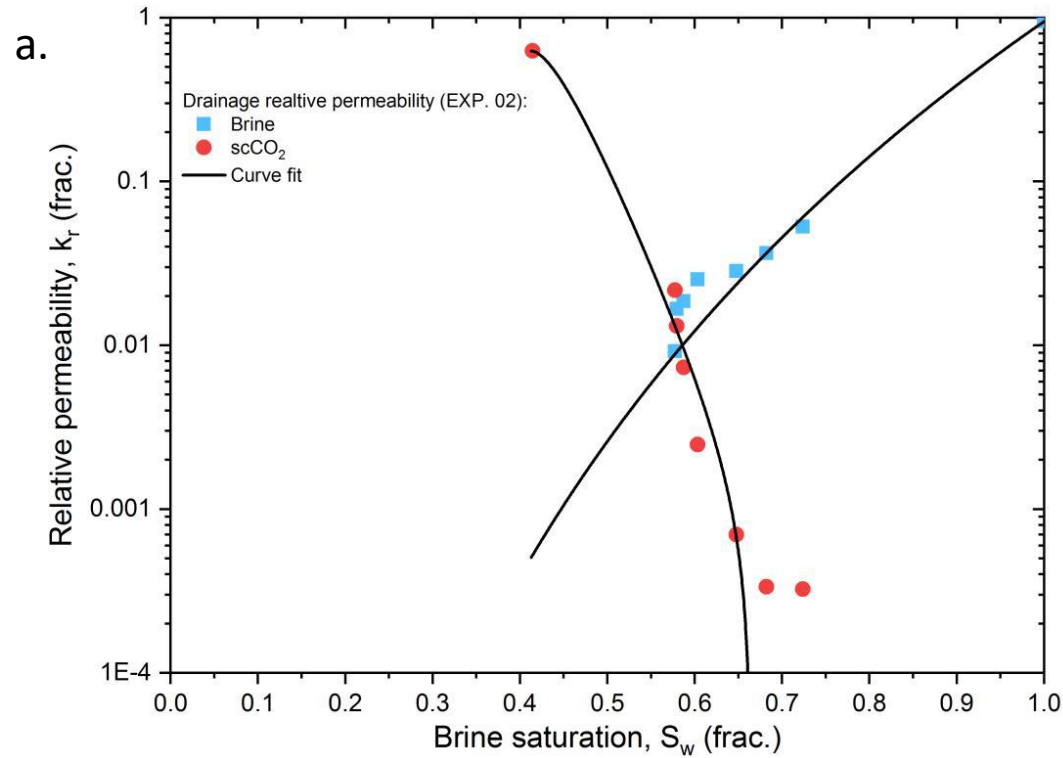
Technical Objectives: Unsteady-state core flooding experiments



Initial and residual $scCO_2$ saturation at different locations along the length of a sample. The values are reported at the end of drainage and imbibition processes for three different experiments.



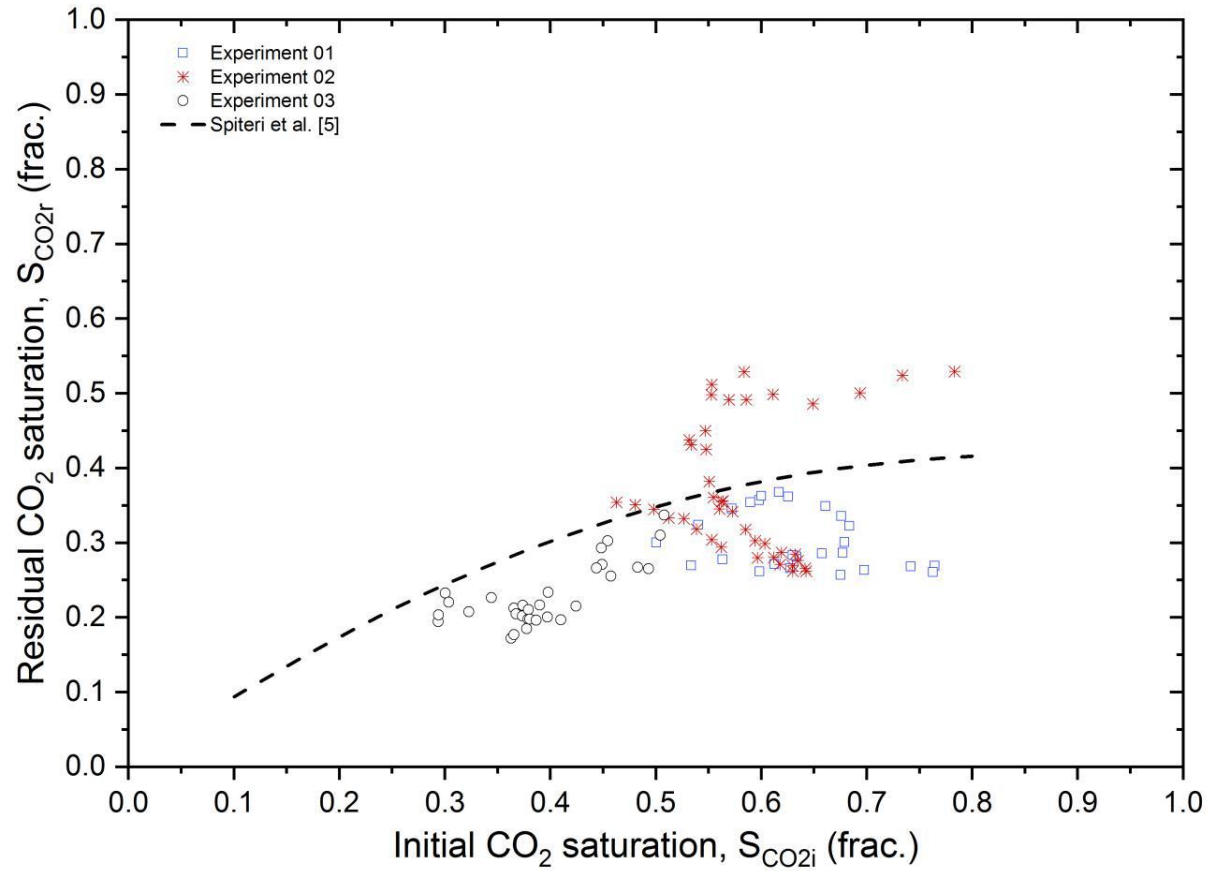
Technical Objectives: Unsteady-state core flooding experiments



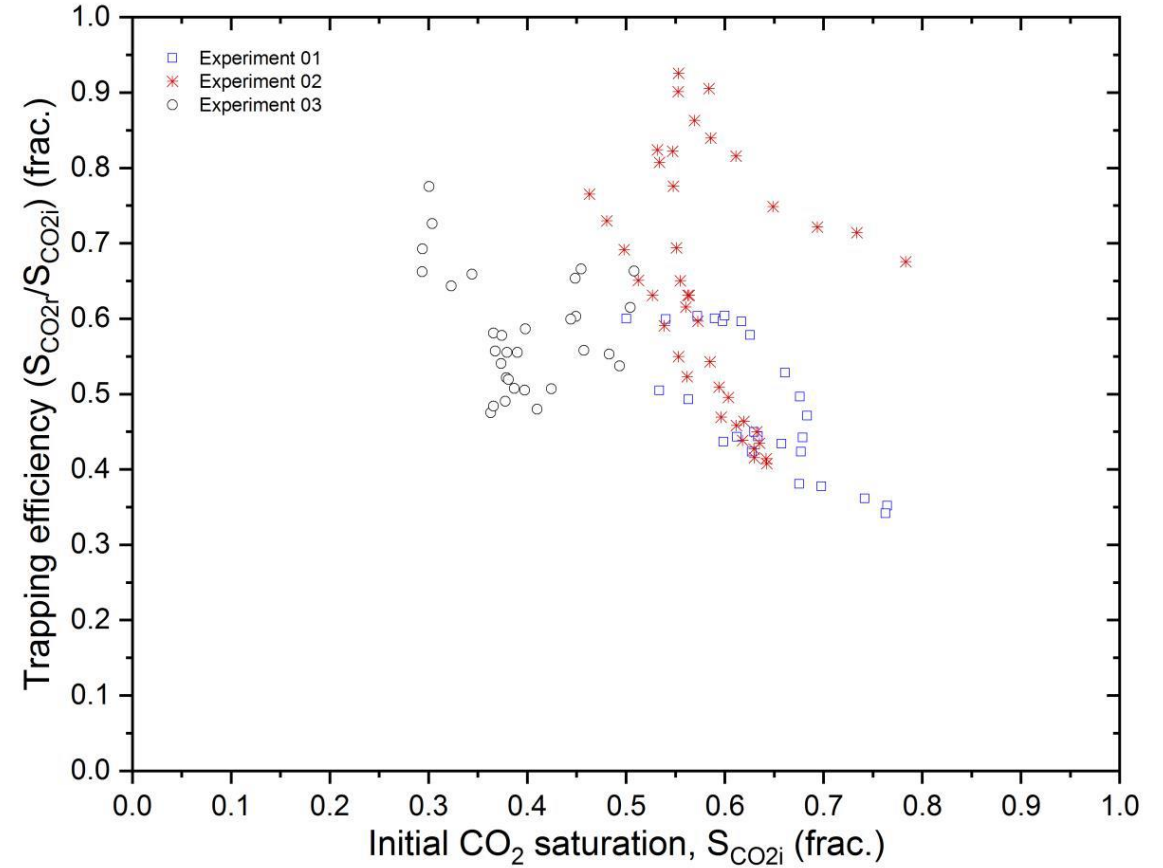
Brine and scCO₂ relative permeabilities of (a) drainage and (b) imbibition during an a full cycle experiment



Technical Objectives: Unsteady-state core flooding experiments



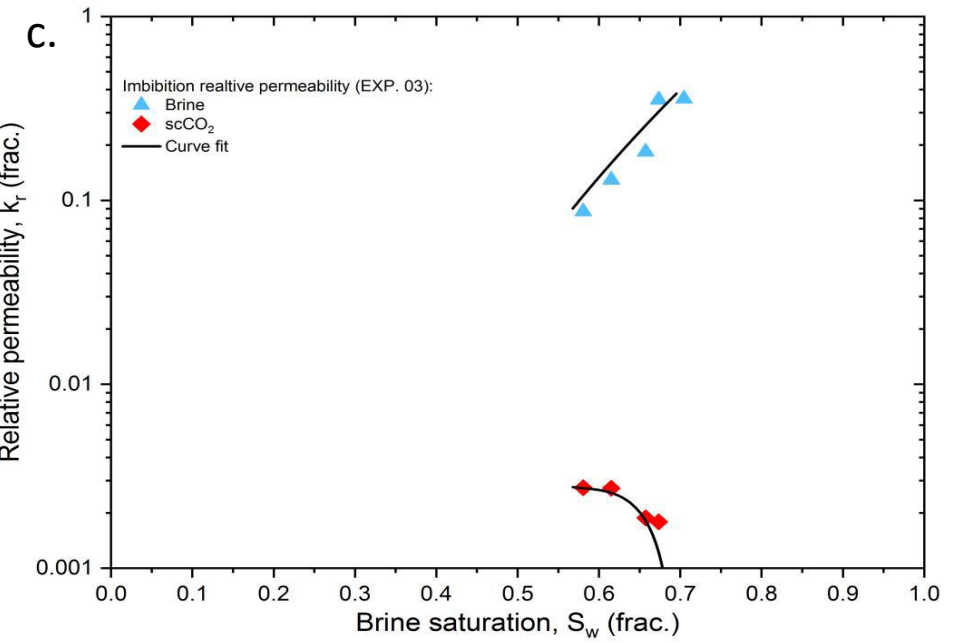
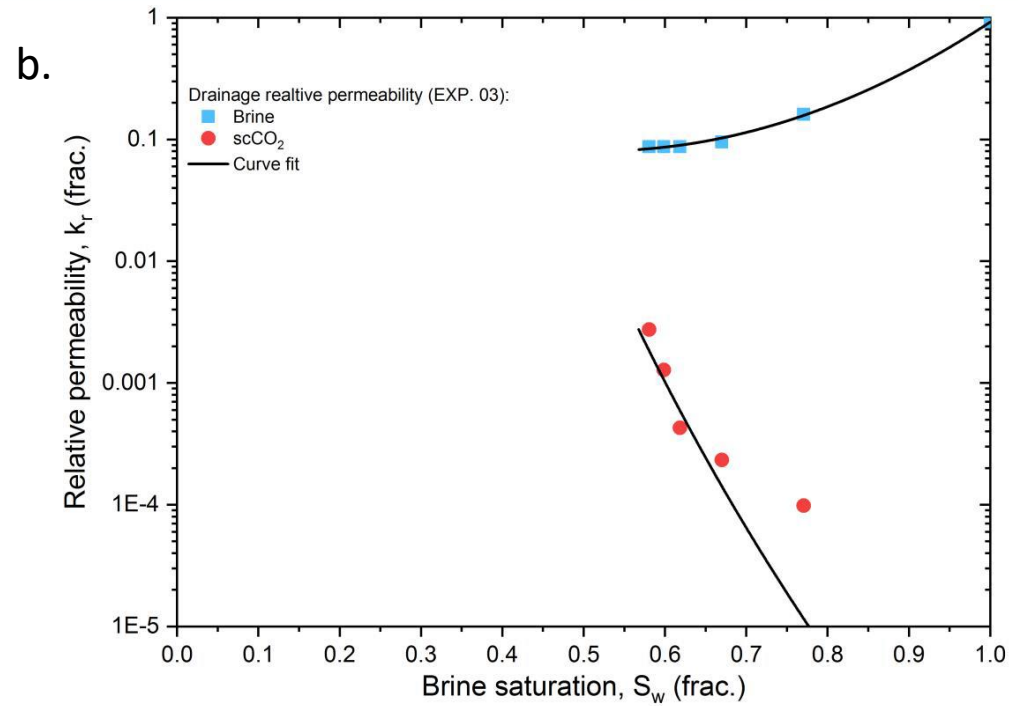
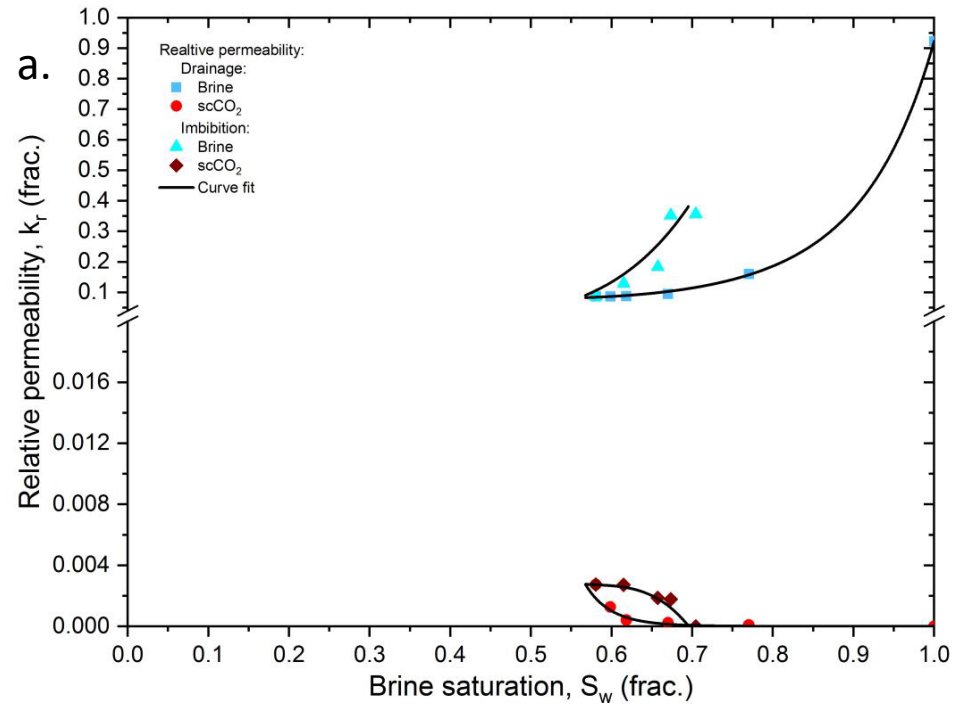
Variation of slice-averaged residual scCO₂ saturation (at the end of imbibition processes) with initial scCO₂ saturation (at the end of drainage processes).



Variation of trapping efficiency with initial CO₂ saturation (at the end of drainage) under capillary-dominated regime.



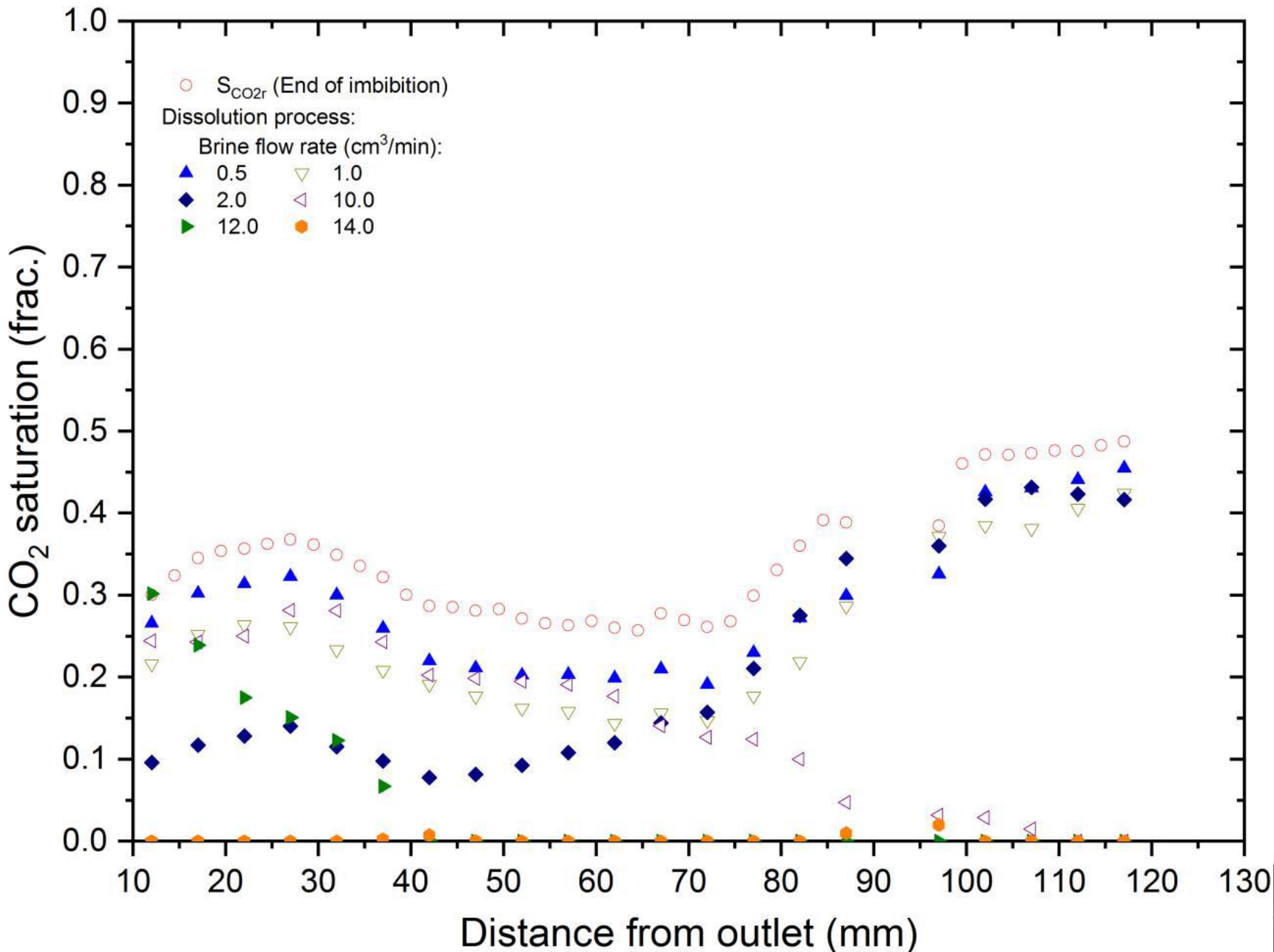
Technical Objectives: Unsteady-state core flooding experiments



Brine and scCO₂ relative permeabilities (scanning curves) obtained during one experiment; (a) both drainage and imbibition, (b) drainage, and (c) imbibition.

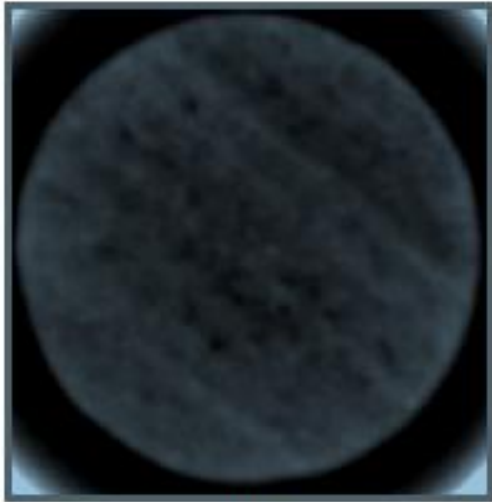


Technical Objectives: In-situ CO₂ dissolution

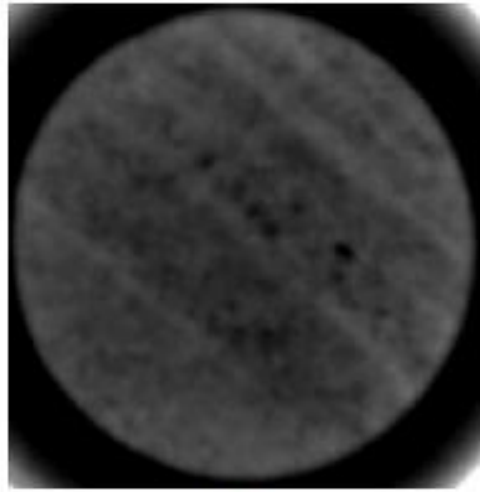


Changes in scCO₂ saturation during dissolution of trapped globules of supercritical carbon dioxide by distance from outlet at different flow rates.

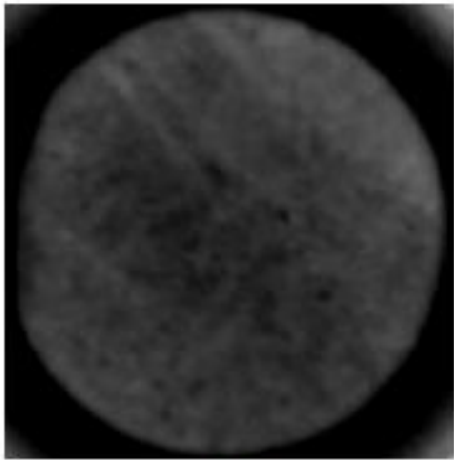




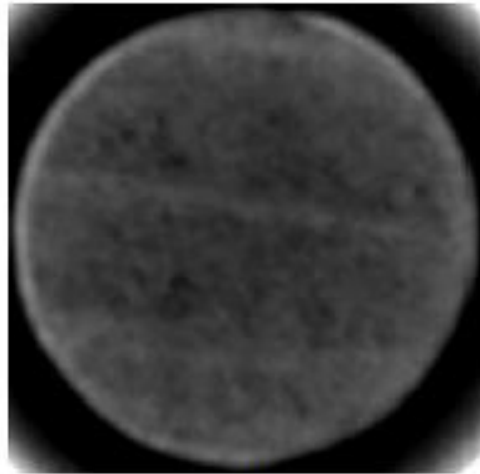
(a)



(b)



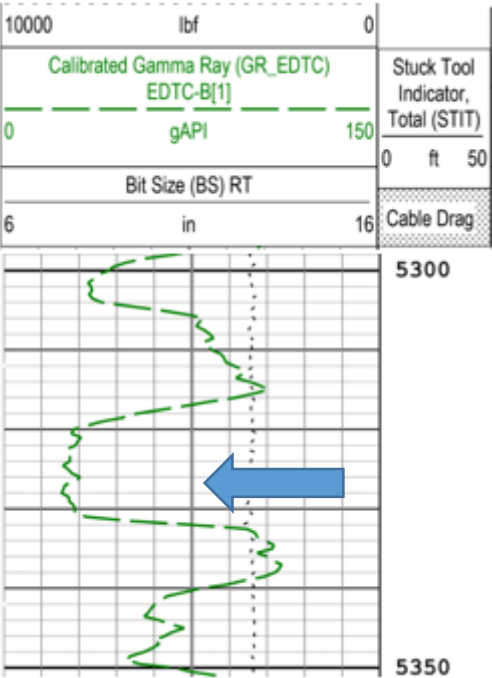
(c)



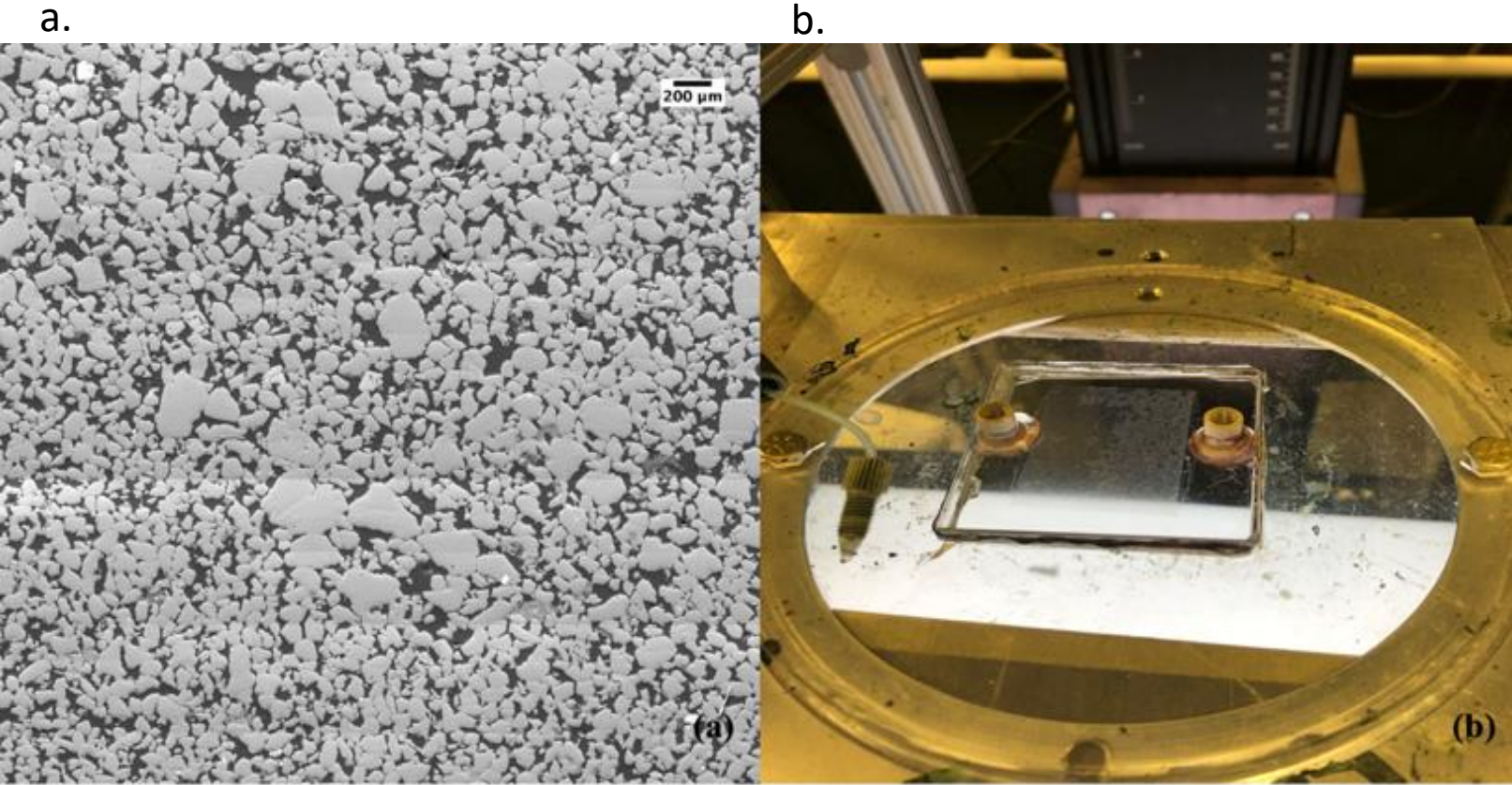
(d)

X-ray images of the core sample at different locations along its length obtained at the end of the flooding experiments to identify changes to the character of the plugs.





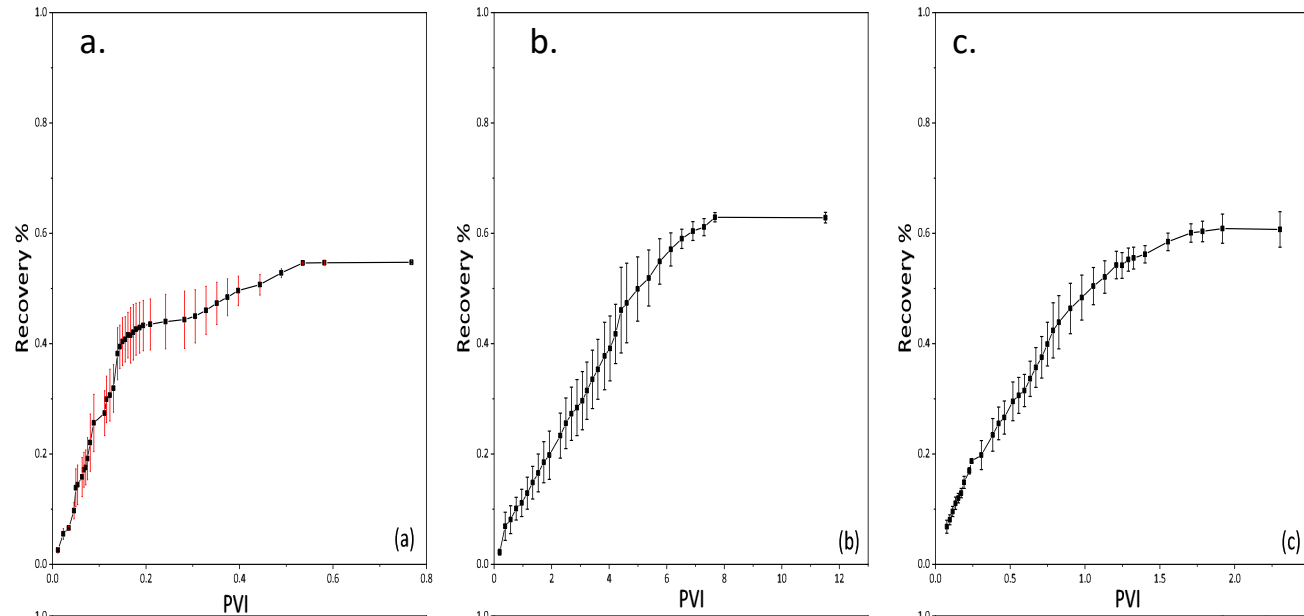
Petrophysical log data from a Schlumberger Sonic Scanner log over the sampled reservoir interval (sample represented by blue arrow)



SEM image of the thin-section(a) and fabricated microfluidic device (b).

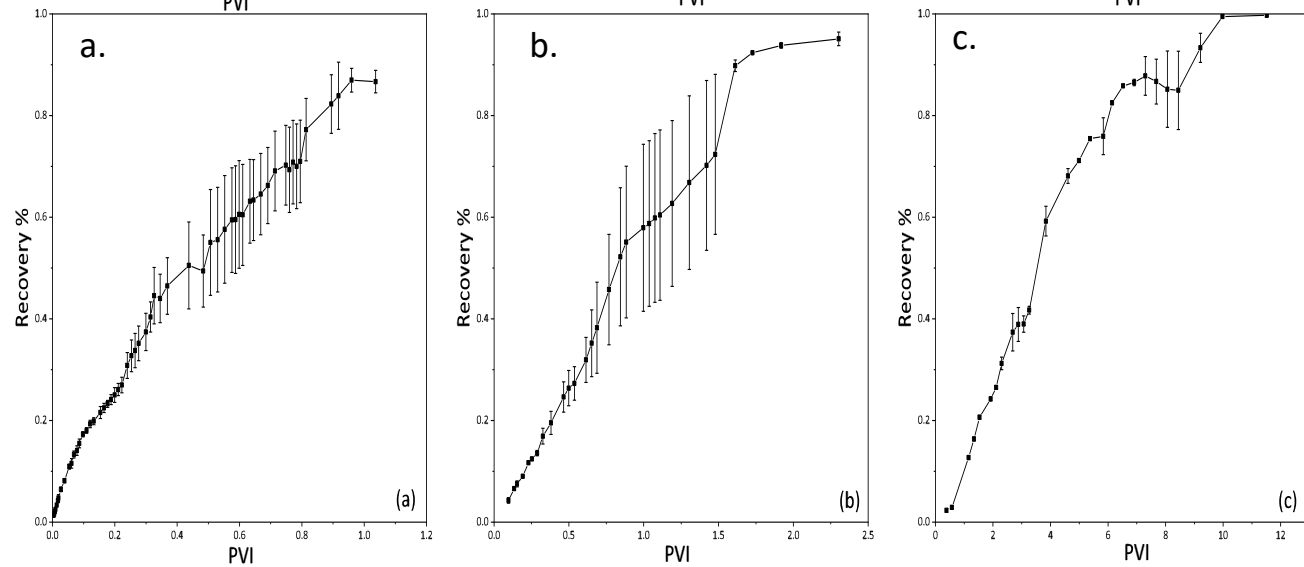


1.



1. The percentage of brine recovery from gas injection at: (a) 0.1 $\mu\text{L}/\text{min}$, (b) 1 $\mu\text{L}/\text{min}$ and (c) 10 $\mu\text{L}/\text{min}$.

2.



2. The percentage of brine recovery from foam injection at: (a) 0.1 $\mu\text{L}/\text{min}$, (b) 1 $\mu\text{L}/\text{min}$ and (c) 10 $\mu\text{L}/\text{min}$.

