LABORATORY EXPERIMENTS AND MODELING TO ACCURATELY EVALUATE CRITICAL CO_2 SATURATION FOR GEOLOGIC CARBON STORAGE

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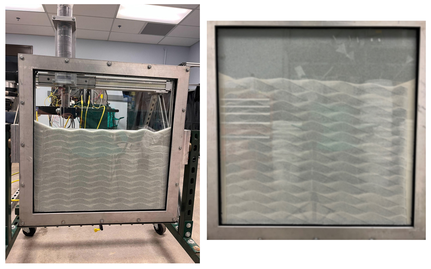
INTRODUCTION

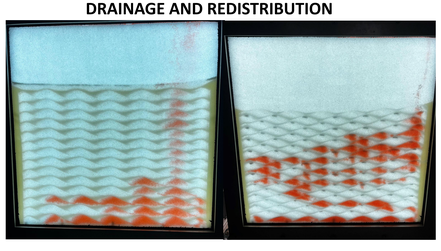
- Our **goal** is to better understand the effect of small-scale heterogeneity on capillary trapping, so in the future more accurate upscaling models can be constructed for field-scale simulation.

METHODOLOGY

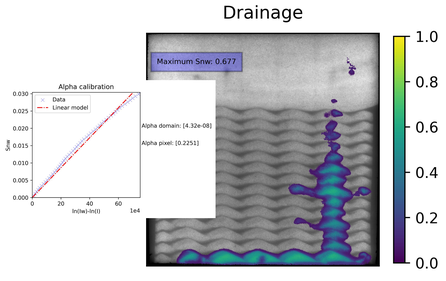
SANDBOX PACKING



DRAINAGE AND REDISTRIBUTION



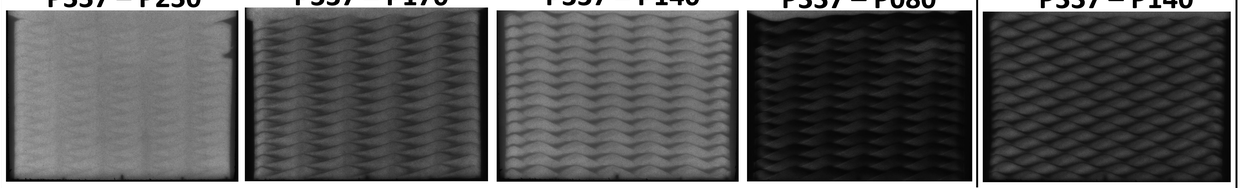
DATA PROCESSING



ONGOING WORK

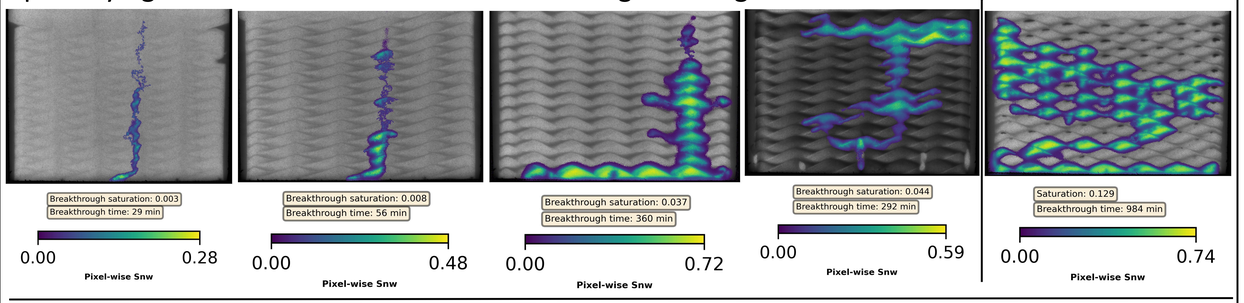
We packed the sandbox with in-phase and climbing ripples using different bead size contrasts:

P337 – P230 | **P337 – P170** | **P337 – P140** | **P337 – P080** | **P337 – P140**



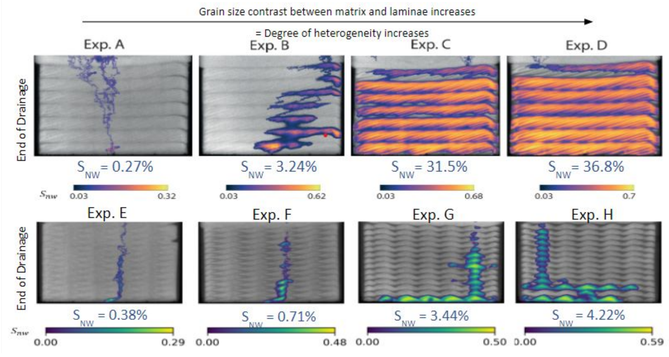
IN-PHASE RIPPLES | **CLIMBING RIPPLES**

We estimated non-wetting phase saturation and breakthrough time for each experiment, by quantifying the attenuation of the transmitted light through the medium.



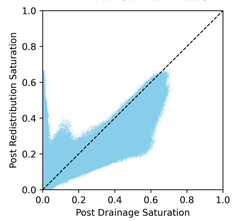
RESULTS SUMMARY

Saturation differs from one bedform architecture to another.



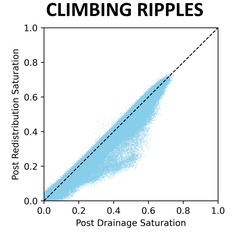
Even small changes in the same bedform can lead to more trapping.

IN-PHASE RIPPLES



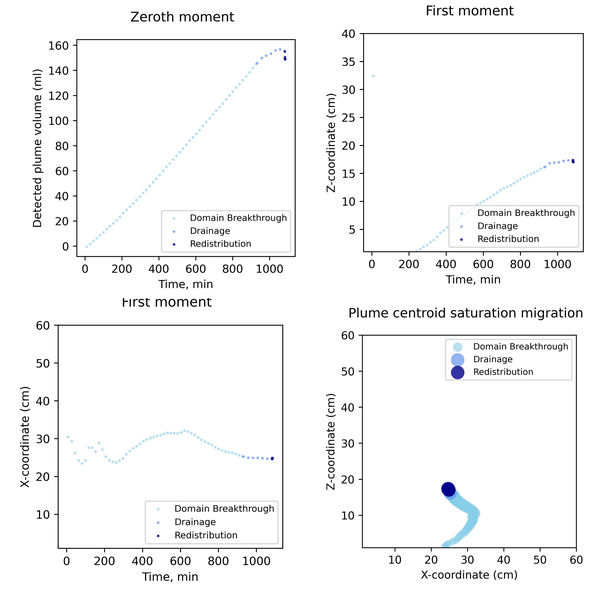
Drainage S_{nw} :4.7%
Redistribution S_{nw} : 4.5%
Trapping efficiency: 0.948

CLIMBING RIPPLES



Drainage S_{nw} :13.9%
Redistribution S_{nw} : 13.3%
Trapping efficiency: 0.957

Further analysis allows us to track plume centroid migration in the domain.



FUTURE WORK

- Build a geological facies library providing critical CO_2 saturation values.
- Validate sandbox results with core-flood experiments.

ACKNOWLEDGEMENTS

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REFERENCES

Krishnamurthy, P. (2020). *Geologic heterogeneity controls on CO_2 migration and trapping*