Contribution ID: **744** Type: **Oral Presentation**

Pore-Scale Dynamics in Carbonate Reservoirs: Understanding Heterogeneity's Influence on CO2 Storage in Indiana Limestone

Tuesday, 14 May 2024 12:45 (15 minutes)

Subsurface carbon dioxide (CO2) storage is one of the most critical strategies in combatting climate change. One of the principal challenges encountered by the Carbon Capture and Storage (CCS) industry is the accurate understanding, representation, and upscaling of fluid flow dynamics within targeted reservoir formations. This problem is rather complex in carbonate formations due to their varying spatial heterogeneities and complex pore structures. In our experiment, we assess the impact of microporosity, heterogeneity and connectivity on saturation changes, and trapping in Indiana limestone samples.
We image Indiana limestone core samples using a high-resolution µCT scanner, with a resolution of 4.9 µm. Through two cycles of drainage and imbibition, we flooded the core with two different flow rates, to understand the influence of heterogeneity on the mobility of both wetting and non-wetting phases within the porous media. During the two cycles, the pore-scale capillary number was kept well within the capillary flow regime (10-7 - 10^-8). Our study highlights noticeable differences in saturation, non-wetting connective path, and dynamics of pore-filling between the two flooding cycles. Additionally, we show the redistribution of the non-wetting phase across the pore space when increasing the non-wetting phase flow rate. Furthermore, we investigate intermittent flow observed during imaging manifesting as artefacts within the reconstructed 3-D volume. This exploration aims to elucidate the origins and implications of intermittency, providing valuable insights into its impact on imaging quality and interpretation of pore-scale fluid dynamics.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

I would like to submit this presentation into both awards

Country

United Kingdom

Porous Media & Biology Focused Abstracts

References

Conference Proceedings

I am not interested in having my paper published in the proceedings

Primary author: DARRAJ, Nihal (Imperial College London)

Co-authors: SPURIN, Catherine (Stanford University); BLUNT, Martin (Imperial College London); PINI, Ronny (Imperial College London); KREVOR, Sam; MANOORKAR, Sojwal (Ghent University); Dr BERG, Steffen (Shell Global Solutions International B.V.)

Presenter: DARRAJ, Nihal (Imperial College London)

Session Classification: MS01

Track Classification: (MS01) Porous Media for a Green World: Energy & Climate