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Type: **Poster Presentation**

Pore-scale insights on hysteretic behaviour during cyclic injection in porous media

Monday, 19 May 2025 09:55 (1h 30m)

Effective underground hydrogen storage in porous rocks requires handling cycles of storage and withdrawal while minimising residual gas saturation, which represents an irrecoverable loss of stored gas and significantly impacts economic feasibility. We will present our recent results on numerical and experimental developments focusing on micromodel systems to investigate these phenomena. The numerical tool is designed to track the pore-scale invasion dynamics under cyclic conditions. Our experimental setup aims to investigate the effects of solid deformation and pore structure on trapping behaviours under quasi-2D conditions using microcell models. We emphasise the observed cyclic and hysteretic behaviour of residual saturation, highlighting the notable differences between the continuous and cyclic injection scenarios. Furthermore, the effects of pore topological features and solid deformation on hydrogen retention will be explored, showing the importance of pore-scale features and their interplay with the wettability and injection scenarios. Finally, the need to develop a constitutive model designed to capture these cyclic features will be discussed for providing essential tools for optimising underground gas storage options.

Country

Australia

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References

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