

Special Issue

Multiscale Modelling and Optimisation of Underground Hydrogen Storage and CO₂ Sequestration Systems

Message from the Guest Editors

This Special Issue seeks contributions that advance multiscale modelling, data assimilation and optimisation for hydrogen and CO₂ in porous reservoirs. We welcome studies on hydrodynamics, thermo–hydro–chemo–mechanical coupling; pore-to-reservoir upscaling; reactive transport; wellbore integrity; fault, caprock and heterogeneity effects; cyclic operation for hydrogen withdrawal/injection; and interactions with residual hydrocarbons, brines and contaminants. Topics include the following

- Site characterisation and capacity–deliverability assessment;
- Monitoring design and inversion;
- Optimal control of injection/withdrawal schedules;
- Repurposing oil and gas infrastructures for CO₂ or H₂ storage projects;
- Co-location of CO₂/H₂ storage and offshore wind projects; opportunities and challenges;
- Surrogate modelling/ML, reduced-order models, and digital twins.

Guest Editors

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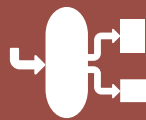
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Deadline for manuscript submissions

closed (30 April 2026)



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