Special Issue

Multiscale Modelling and Optimisation of Underground Hydrogen Storage and CO_2 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.

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Editor-in-Chief

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