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Predictive Modelling Of CO2 Storage In Aquifers: Integrating The Effects Of Boundary Conditions And Saturation Functions

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Summary

In reservoir engineering, the predictive analyses of CO2 sequestration in subsurface formations commonly employ numerical models of subsurface formations. A significant number of work have utilised numerical modelling techniques to predict the impact of the reservoir’s boundary conditions and interlayer communication on CO2 storage capacity in aquifers. To the best of our knowledge, no study on the impact of boundary conditions on CO2 storage efficiency has focused on the combined effect of this factor in the reservoir and saturation functions in the caprock. To this end, this study examined the effect of integrating both processes on pressure evolution in the caprock during the numerical simulation of CO2 injection into a deep saline aquifer. Utilising the Sleipner benchmark model, we also showed how varying saturation functions in the caprock can affect the storage efficiency in the reservoir formation.

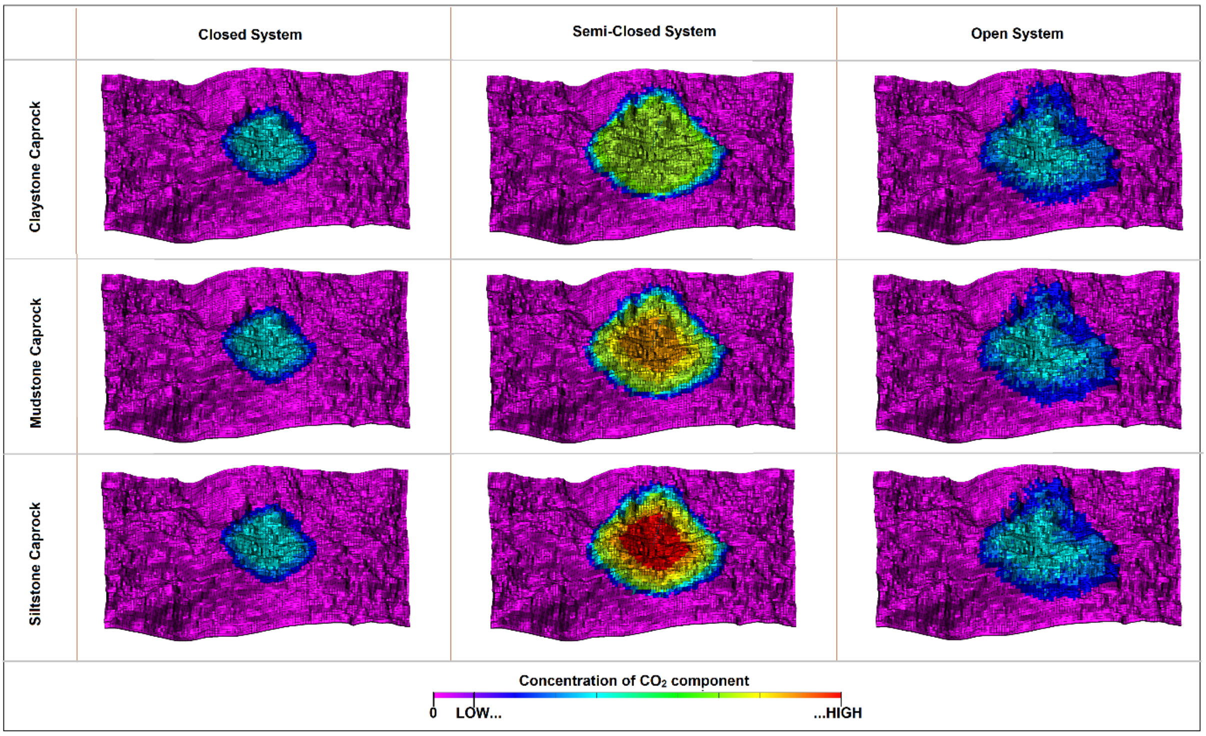

Figure 5 *Concentration of mobile CO_2 in the base layer of the caprock at the end of simulation.*

Conclusions

This study shows that the most efficient mechanism for gas transport through mudrocks is the pressure-driven volume flow of the mobile gas phase. The ease of such pressure-driven flow through silt-rich shale barriers, as opposed to clay-rich shale barriers, portrays the importance of relative permeability functions in low permeability units. Hence, adopting this approach for the simulation of CO_2 permeating through shale barriers in a reservoir formation will enhance precision in the predictive analysis of gas breaking through interlayer baffles.

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