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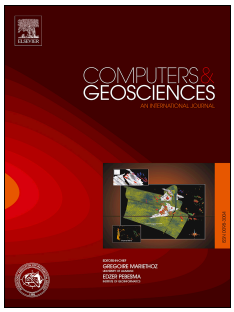

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An innovative computationally efficient hydromechanical coupling approach for fault reactivation in geological subsurface utilization

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Keywords

Hydromechanical coupling; Semi-analytical coupling; Multiphase fluid flow; Geological faults; Numerical simulation; Subsurface gas storage

Abstract

Estimating the efficiency and sustainability of geological subsurface utilization, i.e., Carbon Capture and Storage (CCS) requires an integrated risk assessment approach, considering the occurring coupled processes, beside others, the potential reactivation of existing faults. In this context, hydraulic and mechanical parameter uncertainties as well as different injection rates have to be considered and quantified to elaborate reliable environmental impact assessments. Consequently, the required sensitivity analyses consume significant computational time due to the high number of realizations that have to be carried out. Due to the high computational costs of two-way coupled simulations in large-scale 3D multiphase fluid flow systems, these are not applicable for the purpose of uncertainty and risk assessments.