

A feasibility study of gravimetric methods for monitoring geologic CO₂ sequestration into aquifers

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To appraise the utility of gravimetric methods for monitoring CO₂ injected into aquifers, we carried out numerical simulations of two aquifer systems. One is an aquifer system underlying a portion of Tokyo Bay. Another is an axisymmetric system, that is, a vertical injection well in a homogeneous permeable aquifer confined between impermeable aquitards above and below.

We used the STAR general-purpose reservoir simulator with the CO₂SQS equation-of-state package which treats three fluid phases (liquid- and gaseous-phase CO₂ and an aqueous liquid phase) to calculate the evolution of reservoir conditions, and then used postprocessor to calculate the resulting temporal changes in the earth-surface distributions of microgravity.

These calculations of gravity change suggest that microgravity monitoring can be an effective technique for characterizing the subsurface flow of CO₂ injected into underground aquifers. The signal strengths calculated here are not particularly large, but should be detectable using a high-precision absolute/relative hybrid gravity measurement technique.