Numerical simulation of CO2 storage at Ketzin: The impact of heterogeneity on the distribution of CO2

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In order to increase the understanding of geological CO2 storage, data obtained from on-site monitoring at the Ketzin injection site (CO2SINK) are being used to verify the results of numerical models. As with all reservoirs, the uncertainties inherent in the Ketzin formation prevent the resolution of a deterministic state. These uncertainties are caused by heterogeneities within the reservoir and, along with additional error caused by the discretisation of the numerical model, lead to inaccuracies in the conceptualization of the hydrogeology of the site.

In order to cope with the uncertainties, stochastic methods are investigated and compared to a homogeneous deterministic model. The comparison is made at the CO2 breakthrough point, measured after 21 d at an observation well located 50 m from the point of injection.

With the use of stochastic methods, it is possible to estimate a probability distribution of the CO2 plume, but the standard deviation of the material properties and calculated CO2 saturation levels increases with the amount of uncertainty in the formation. The uncertainty of the reservoir is positively correlated with increasing time and distance from the injection point. For the 21 d simulation, however, the fingering effect can be neglected, and a homogeneous model is satisfactory.