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# An approach for history matching of reservoir pressure and arrival time – An example from the Ketzin pilot site, Germany

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The Ketzin site is the first pilot project for $CO_2$ storage in Germany. The site is located in Brandenburg about 25 km from Berlin. Since June 2008, $CO_2$ is injected into a saline aquifer in about 630 m to 650 m depth. The total amount of injected $CO_2$ is much smaller (< 100.000 tons) than expected on industrial scales. However, the site is an excellent pilot project for monitoring and history matching.
Beneath the injection well, two observation wells were drilled in 2007. An important task of the dynamic modelling activities is the history match of the reservoir pressure and the $CO_2$ arrival at the observation wells. The number of degrees of freedom in a strongly heterogeneous domain is much too high for a well-posed inverse problem. Therefore, the history match requires a systematic successive procedure. What we present here is in a first step the attempt to match the pressure at the injection well since we expect the highest sensitivity to the data here. The pressure at the injection well and the first arrival time will be matched by using an inverse modelling technique. Therefore, three parameters, (1) permeability near the injection well, (2) the overall field permeability and (3) the porosity are varied. All other parameters are assumed to be known although this is a very severe restriction. In a second step the pressure at the second observation well will be matched as well. The second arrival time was observed much later than initially predicted by the models. One out of several possibilities to explain this delay is the existence of a low permeable barrier right below the top of a sand channel.
The $CO_2$ as the lighter one of the two fluid phases water and $CO_2$ can be retained at this barrier and will start flowing beneath the barrier not before a certain threshold amount of $CO_2$ reached the barrier.