



Current status of the modelling activities at the Ketzin CO₂ storage site

Thomas Kempka (1), Holger Class (2), Uwe-Jens Görke (3), Olaf Kolditz (3), Michael Kühn (1), Ursula Lengler (1), Inga Moeck (1), Ben Norden (1), Lena Walter (2), Björn Zehner (3), and the CO2MAN modelling Team

(1) GFZ German Research Centre for Geosciences, Potsdam, Germany (kempka@gfz-potsdam.de), (2) Stuttgart University, Hydromechanics and Modelling of Hydrosystems, Germany (holger.class@iws.uni-stuttgart.de), (3) Environmental Research Centre (UFZ), Leipzig, Germany (uwe-jens.goerke@ufz.de)

Static geological and dynamic flow modelling at the Ketzin storage site was conducted during different phases of former projects depending on increasing data availability with time. First modelling activities relevant for issues of permitting and operational site design were conducted based on pre-existing information extracted from data of wells drilled nearby the planned injection site and natural analogues. For that purpose, simplified radially symmetric models were applied until a first version of the static geological 3D model was available.

Using this preliminary 3D model first predictions of CO₂ arrival time at the observation wells were made with different simulators resulting in a reasonable agreement with the later real arrival time depending on the choice of injection rate and boundary conditions. Subsequent to the drilling of the three wells at the Ketzin site, well data was available for the further development of the static geological model followed by simulations to predict the CO₂ arrival times at both observation wells. The numerical simulation codes ECLIPSE 100 (black-oil simulator), ECLIPSE 300 (compositional CO₂STORE) and MUFTE-UG (2p2ni_CO₂) were used for a history match applying the real injection rates. Regarding the real injection regime the computational results show a relatively good agreement with the data effectively measured at the first observation well.

However, the real arrival time at the second observation well exceeded the calculated ones by a factor of three. Uncertainties related to the geological model and parameter choices made by the modellers as well as in the conceptual approaches applied in the different simulators are currently being discussed in detail to reflect these deviations.

Further studies, such as the implementation of heterogeneities at the facies-scale (low permeability barrier between the injection and second observation well) revealed one reasonable explanation for the late arrival. Nevertheless, further research on the sensitivity of input parameters is currently conducted within the scope of the CO₂MAN project involving integration of recent geophysical monitoring data and extensive reservoir simulations to improve the understanding of the geological heterogeneities at the Ketzin site and their impact on the CO₂ plume distribution.