



Validation of the MUFITS reservoir simulator against standard industrial simulation tools for CO₂ storage at the Ketzin pilot site

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We give an overview of the reservoir simulator MUFITS capabilities for modelling underground carbon dioxide storage using the EOS-modules GASSTORE and BLACKOIL. The GASSTORE module covers three-phase solid-liquid-gas flows of water, carbon dioxide and salt components. The extended black-oil model is utilized in the BLACKOIL module, which can be applied in the CO₂ storage scenarios to two-phase flows of CO₂ and brine components. The modules allow comprehensive options including salt precipitation/dissolution, thermal processes, multiple properties regions, and complicated initial vertical equilibration. The PVT tables for the BLACKOIL module can be generated automatically from the GASSTORE module for a given reservoir temperature and brine salinity. We test the simulator against published benchmarking studies.

We then consider an application case of CO₂ storage at the Ketzin pilot site in Germany. For that purpose, we use a calibrated 3D geological reservoir model comprising a highly heterogeneous distribution of porosity and permeability in a fluvial geological setting. The simulation is conducted using the EOS-module BLACKOIL and the modelling results are in excellent agreement with the results of the industrial simulators applied in previous benchmarks. In particular, the bottom-hole pressure in the injection well, the total mass of dissolved CO₂ and spatial CO₂ distribution are identical with previously published results.