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The Ketzin Project – Progress of Europe's longest-operating on-shore CO2 Storage Site

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At Ketzin, near Berlin, the German Research Centre for Geosciences operates Europe's longest-running on-shore CO2 storage site. Since June 2008, CO2 is injected into a saline aquifer of the Upper Triassic Stuttgart Formation in an anticlinal structure of the Northeast German Basin. After 2.5 years of operation, about 44,000 tons of food-grade CO2 have been injected safely via one well into a target reservoir at a depth of $\sim$ 630 to 650 m. We present the key results from the site operation, monitoring and modeling and outline future activities.
Multi-disciplinary monitoring at Ketzin combines geophysical, geochemical and microbiological investigations for a comprehensive characterization of the reservoir processes and the CO2 migration. Surface and down-hole geophysical measurements are applied to test and optimize the resolution of different methods and to visualize the CO2 plume. Active seismic is spearheaded by time-lapse 3D measurements, carried out in 2005 and 2009. After 15 months of injection, the CO2 plume was concentrated around the injection well (lateral extension $\sim$ 300 to 400 m, thickness $\sim$ 5 to 20 m). Electric Resistivity Tomography is sensitive to saturation changes caused by the migration of the supercritical CO2 within the originally brine-filled reservoir. A time-lapse sequence from a permanently installed vertical electric resistivity array in all three Ketzin wells shows a significant resistivity increase at the reservoir level since the beginning of the CO2 injection. Temperature conditions in all wells are monitored using distributed temperature sensing. The temperature evolution within the injection interval, the CO2 arrival and the evolution of two-phase P/T conditions in both observations wells are detected with high temporal and spatial resolution.
All data available from the Ketzin wells and the different monitoring techniques are compiled in an updated geological model of the site. Integrating field and lab data, subsequent numerical modelling investigates coupled processes in the Stuttgart Formation and its caprock taking into account hydrodynamics, thermodynamics, geochemistry and geomechanics.
The Ketzin project is thus far the only active CO2 storage site in Germany with a reliable infrastructure for injection and excellent opportunities for comprehensive on-site research. Ketzin demonstrates successful CO2 storage and interdisciplinary monitoring in a saline aquifer on a research scale. The gained results underline the necessity for further storage projects on a demonstration scale. The EU project CO2SINK (FP6) ended in March 2010. CO2 injection, monitoring and modelling continue at Ketzin. Two new projects CO2MAN (CO2 Reservoir Management, funded by the Federal Ministry of Education and Research) and CO2CARE (CO2 Site Closure Assessment Research, funded by the EU) succeed CO2SINK. Planned activities include the installation of a new observation well and a particular focus on the development and testing of abandonment procedures.